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Statistical Analysis and Generation of Driving Cycles from the St. Louis Heavy-Duty Chase-Car Data

Systems Control, Inc, Anaheim, CA Environmental Engineering Div

Prepared for

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STATISTICAL ANALYSIS AND GENERATION OF DRIVING CYCLES FROM THE ST. LOUIS HEAVY DUTY CHASE-CAR DATA

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Emission Control Technology Division
Ann Arbor, Michigan 48105

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Contract No. 68-03-2429

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April 1977

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FOREWORD

This project was conducted for the U.S. Environmental Protection Agency by Olson Laboratories. The EPA Project Officer was Leroy Higdon.

The Project was under the overall direction of Malcolm Smith who served as Project Manager.

ABSTRACT

This report presents a summary and documentation of the work performed under EPA Contract NO. 68-03-2429 entitiled "Statistical Analysis and Generation of Driving Cycles from the St. Louis Heavy-Duty Chase-Car Data." Program objectives were successful met with a statistical analysis of the driving patterns of 70 trucks and 5 buses, the development of driving cycles representative of various categories of operational data, and a comparison of the St. Louis and CAPE-21 data bases to help validate the assumption that the CAPE-21 cities, New York City and Los Angeles, represent extremes in heavy-duty vehicle speed patterns.

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Section 1

SUMMARY

This report presents the results of Contract No. 68-03-2429 entitled "Statistical Analysis and Generation of Driving Cycles from the St. Louis Heavy-Duty Vehicle Chase-Car Data." The objectives of the program were to reduce the data collected, to generate representative driving cycles, and to generate output for comparison with data summaries derived from the CAPE-21 project in New York City and Los Angeles. In particular, that comparison was required to help validate the assumption that New York City and Los Angeles represent the extremes in heavy-duty vehicle operation patterns.

The St. Louis chase-car data were collected under Intergency Agreement No. IAG-D5-0731. The CAPE-21 program was jointly sponsored by the Coordinating Research Council, Inc., and the EPA. The New York data were collected under EPA Contract No. 68-01-0478, and the Los Angeles data were collected by EPA personnel with support from Olson Laboratories, Inc.

Driving pattern data were collected in the St. Louis metropolitan area by chasing 70 heavy-duty commercial vehicles, including trucks of various axle configurations, and 5 buses, all operating under normal driving conditions in normal operational situations.

The data were acquired by a vehicle instrumented with a digital data acquisition system, utilizing the "chase-car" concept, whereby the instrumented vehicle was operated in the field so as to emulate the driving patterns of various heavy-duty vehicles. Operating parameters of vehicle speed, manifold vacuum, and time, along with various descriptors, were obtained from the chase vehicle and recorded on magnetic tape for computer batch processing.

The data were processed to provide vehicle-speed frequency and distribution functions, vehicle initial-speed- versus-delta-speed matrices, and vehicle stop distributions; together with summary information on basic vehicle operating modes of acceleration, deceleration, cruise, and idle.

A category analysis was conducted in which variations in statistical parameters associated with matrices within specified data categories were used to assess the significance of the variation in the parameters between the data categories. Initial-speed-versus-delta-speed matrices for EPA-selected groupings of operational data, based on the category analysis, were used to generate driving cycles for each of the following five data categories:

1. All Trucks - Freeway
2. All Trucks - Nonfreeway
3. Express Buses - Freeway
4. Express Buses - Nonfreeway
5. Transit Buses - Nonfreeway.

A total of 153,500 cycles was generated and 19 candidate cycles were selected for submission to the EPA Project Officer for consideration. Three 10-minute cycles were selected for each of the above five categories, three 20-minute cycles were selected for express buses operating on freeways, and a single 20-minute cycle was obtained for the category of all trucks operating on freeways.

Finally, specific determinations were made of the differences among the St. Louis data, the New York City CAPE-21 data, the Los Angeles CAPE-21 data, and between a composite of the New York City and Los Angeles data and the St. Louis data for similar truck categories as well as for the overall data bases. The comparison of the St. Louis and CAPE-21 data bases tends to support the assumption that New York and Los Angeles represent the extremes in heavy-duty vehicle speed patterns, but the St. Louis data base is too small for freeway operations to permit a definitive conclusion.

Section 2

INTRODUCTION

This section states the objectives of the St. Louis Heavy-Duty Vehicle Program and presents the basic scope of operations.

2.1 PROGRAM OBJECTIVES

The objectives of this program consisted of the following:

1. To perform a statistical analysis of heavy-duty vehicle chase-car speed data collected in the St. Louis area.
2. To generate driving cycles representative of selected operating patterns as described by matrices of initial speed versus delta speed.
3. To compare summary statistics for the St. Louis data with those obtained from New York and Los Angeles data collected on the CAPE-21 program in order to evaluate the assumption that New York City and Los Angeles represent extremes of driving patterns.

2.2 SCOPE OF OPERATIONS

The program objectives were satisfied with the accomplishment of the following major tasks.

2.2.1 Task 1 - Individual Truck Analysis

This task consisted of determining, for each of the 70 trucks in the St. Louis data sample, the following statistical data:

1. Frequency and distribution functions for:
    a. Vehicle speed
    b. Rolling stops
    c. Full stops - engine-on
    d. Full stops - engine-off
2. Average vehicle speed and miles traveled.
3. Average number of stops per mile.
4. Average time per stop.
5. A matrix of initial speed versus delta speed, derived on a second-by-second basis.
6. Percent of time at idle.
7. Average acceleration and deceleration rates.

2.2.2 Task 2 - Matrix Development

The primary effort on this task was devoted to the creation of initial-speed-versus-delta-speed matrices for various data categories based on range of operation, fuel type, axle configuration, area type, and road type. The statistical data listed for Task 1 were also computed for each of the data categories.

2.2.3 Task 3 - Cycle Development

Upon completion of Task 2, the results of a statistical analysis of the various data categories were used by the EPA to specify the development of 10-minute driving cycles for each of the following data categories:

1. All Trucks - Freeway
2. All Trucks - Nonfreeway
3. Express Buses - Freeway
4. Express Buses - Nonfreeway
5. Transit Buses - Nonfreeway

In addition, 20-minute cycles were developed for the two freeway categories.

2.2.4 Task 4 - Comparison of Summary Statistics

This final task consisted of computing summary statistics for each of the St. Louis, New York, and Los Angeles heavy-duty-truck data samples for the following urban truck categories:

1. Gasoline-fueled trucks
2. Diesel-fueled trucks
3. All trucks
4. All buses.

The statistics for each city were computed both for freeway data and for nonfreeway data.

Section 3

PROGRAM DESCRIPTION

The heavy-duty vehicle-speed data to be processed and analyzed were collected in St. Louis by the East-West Gateway Coordinating Council under Interagency Agreement No. IAG-D5-0731 (Reference 1). Each of 65 trucks and 5 buses was followed by an instrumented station wagon for 1 day of operation called a "chase." A breakdown from Reference 1 of the required and completed chases by vehicle category is given in Table 1.

The purpose of the data collection program in St. Louis was to provide the EPA with data with which to evaluate and validate heavy-duty vehicle-operating data collected in Los Angeles and New York City under the CAPE-21 program. The New York data were obtained by Wilbur Smith and Associates, Inc., under the joint sponsorship of the Coordinating Research Council, Inc., and the EPA (EPA Contract No. 68-01-0478). The Los Angeles data were collected under EPA management using EPA personnel and with the assistance of personnel from Olson Laboratories, Inc. The CAPE-21 data were processed by Olson Laboratories under EPA Contract No. 68-03-0411.

3.1 DATA RECORD

The St. Louis data were recorded at a rate of one record of data per second. As recorded in the field, each record was 27 bytes (characters) long. Subsequent processing by the EPA created the 31-byte records which were analyzed by Olson Laboratories. The following describes the layout and content of each data record on magnetic tape:

BYTES	CONTENT
1-3	Day of Year - Three-digit code for Julian day.
4-9	Time of Day - Hours, minutes, and seconds of military time.
10	Type of Stop 0 = Engine-on bus stop 1 = Operating 2 = Engine-on truck stop 3 = Engine-off truck or bus stop 4 = Lunch/dinner 5 = Coffee break 6 = Comfort 7 = Breakdown/accident 8 = Other (During normal vehicle-chase operations, Code 1 was used. When a vehicle stopped for a prolonged period of time, Code 0, 2, or 3 was entered and the recorder was turned off about 3 seconds later. The clock continued to run with the recorder turned off.)

Table 1. TRUCK CHASES COMPLETED BY CATEGORY

	LOCAL		SHORT		LONG		TOTAL	
	Required Number	Completed	Required Number	Completed	Required Number	Completed	Required Number	Completed
Gas								
2 Axle	27	27	5	4[a]	2	0[a]	34	31
3 Axle	4	4	2	2			6	6
Tractor Trailer	3	3	3	2[a]			6	5
Totals	34	34	10	8	2	0	46	42[a]
Diesel								
2 Axle	3	3[b]					3	3
3 Axle	3	3					3	3
Tractor Trailer	3	3	5	5	5	5	13	13
Totals	9	9	5	5	5	5	19	19
Buses	2	2	3	3			5	5
Substitution Runs[a]								
Tractor Trailer (Diesel)						4		4
Grand Total							70	70

[a] Four substituted truck chases replace four of the truck chases in the regular truck sample.

[b] One three-axle truck chase was substituted for one of the two-axle truck chases.

11-12 Truck Number

13-15 Vehicle Speed - In tenths of mph.

16-18 Manifold Vacuum - In tenths of Hg.

19 Flag

0 = Testing mode (data not included in analysis).

1 = Chase mode

2 = Catch-up mode (data not included in analysis).

(Code 0 was used when testing the equipment, Code 1 was used during the actual chase, and Code 2 was used to indicate the data were not valid because the chase-car was either not in the chase mode or was not in position to evaluate properly the operation of a chased vehicle.)

20 Weather

0 = Clear and hot

1 = Clear and warm

2 = Clear and cool

3 = Cloudy and hot

4 = Cloudy and warm

5 = Cloudy and cool

6 = Light rain

7 = Moderate rain

8 = Heavy rain

9 = Rain stop: wet pavement

21 Road Type

1 = Freeway - Roads with medians and multi-lane pavements with controlled access typified by on-and-off ramps, grade separations, and no traffic lights or stop signs.

2 = Arterial - Roads where traffic flow has priority (few or no stop signs) and which have the capacity to carry high traffic volumes.

3 = Collector and Local - Roads typified by stop signs at intersections, low-capacity design, low speed limits and less than three lanes of traffic.

22 Blank Field

23 Traffic Conditions

1 = Free (Level of Service A). Traffic flow is controlled by driver choice and desires, speed limits, and physical roadway conditions. Speeds are relatively unaffected by presence of other vehicles.

2 = Stable (Levels of Service Band C). Traffic flow where speeds and maneuverability are restricted by traffic conditions. Satisfactory progress is permitted, but free choice of lane and speed is somewhat restricted.

3 = Congested (Levels of Service D, E, and F). Traffic flow is characterized by slow speeds with frequent stops, driver discomfort, and, at times, moderate lines of vehicles.

24 Area Type

1 = Central business district

2 = Central city

3 = Suburban

4 = Rural

25 Turns

0 = Operating

1 = Right
9 = Left

26 Driver - A 1-digit code to designate driver.

27 Navigator - A 1-digit code to designate navigator.

28-29 Axle Code - A 2-digit code to designate axle configuration. For purposes of the present program, four categories were identified:

2 S.U. - Two-axle, single-unit truck
3 S.U. - Three-axle, single-unit truck
TT - Tractor-trailer truck
Bus - Axle configuration ignored

30 Fuel Type
1 = Diesel
2 = Gasoline

31 Range of Operation
1 = Local - Range is the local area - in or around the city and suburbs, or within a short distance of the farm, factory, mine, or other place where the vehicle is stationed.
2 = Short - Range is beyond the local area, over the road, but not more than 200 miles distant from where the vehicle is stationed.
3 = Long - Over-the-road trips are made to points more than 200 miles distant from where the vehicle is stationed.

Of the 31 bytes of data per record, 21 bytes were used to process and analyze the data files. The following list identifies the data parameters used in the conduct of the program:

PARAMETER	CHARACTERS	LIMIT
1. Day of the Year	3	0 to 366
2. Hour	2	0 to 23
3. Minute	2	0 to 59
4. Second	2	0 to 59
5. Type of Stop	1	0 to 8
6. Vehicle Number	2	0 to 70
7. Vehicle Speed	3	0 to 999
8. Road Type	1	1 to 3
9. Area Type	1	1 to 4
10. Axle Type	2	20 to 39
11. Fuel Type	1	1 to 2
12. Range	1	1 to 3

3.2 INDIVIDUAL TRUCK ANALYSIS

3.2.1 Vehicle-Speed Frequency and Distribution Functions

A frequency function of vehicle speed, along with the density and distribution functions in percentage units, was derived for each of the 70 vehicles. The range of speed was from zero to 80 mph in increments of 1-mph. The average speed and the standard deviation were computed both from the second-by-second data and from the matrix density functions. (The average speeds computed these two different ways differed by less than 0.1 mph.)

These functions are shown in Table 2 for Vehicle No. 1 (a tractor-trailer diesel). It should be noted that the frequency is shown both for speeds which are identically zero and for speeds which range from zero to less than 0.5 mph. The frequency for speeds labeled "0" thus includes the frequency for speeds labeled "ZERO."

3.2.2 Initial-Speed-Versus-Delta-Speed Matrix

A compact method for displaying a large volume of second-by-second vehicle speed data is to process the data into an initial-speed-versus-final-speed matrix, where the initial speed is the speed at a given time and the final speed is the speed 1 second later. The initial-speed-versus-final-speed matrix can be further compacted, however, into an initial-speed-versus-delta-speed matrix, where the delta speed is the final speed less the initial speed. Since the matrices for the St. Louis data were formatted to cover a range of speed from zero to 80 mph in a 1-mph increment and a range of delta speed from -10 to 10 mph per second in a 1-mph per second increment, the 81 x 81 initial-speed-versus-final-speed matrix is reduced to an 81 x 21 initial-speed-versus-delta-speed matrix.

As two consecutive records are processed, the speed from the first record is identified as the initial-speed value and the speed from the second record, minus that of the first, is identified as the delta-speed value. A tally is made in the matrix cell corresponding to the pair of values. The second member of the record pair then becomes the first member of the next pair of consecutive records. Table 3 shows the initial-speed-versus-delta-speed matrix for Vehicle No. 1.

The initial-speed-versus-delta-speed matrix was further compacted to provide a quick look at the data by changing the increment in initial speed to 5 mph, thus yielding a 17 x 21 matrix. Table 4 shows the shortened matrix for Vehicle No. 1. The net result of this compression is to produce at a glance the essential concentration points in the matrix. It does, however, have the side effect of producing decelerations from a zero initial speed. This results from the fact that the zero-speed category includes 1-mph and 2-mph initial speeds from the original matrix, from which initial speeds there will generally be decelerations.

Since each cell frequency in the 81 x 21 initial-speed-versus-delta-speed matrix is the number of seconds of operating time in that cell, the matrix contains all of the data needed to compute the following descriptive parameters:

1. Average Speed
2. Speed Standard Deviation
3. Average Accleration Rate
4. Average Deceleration Rate
5. Percent Idle
6. Percent Cruise
7. Percent Acceleration
8. Percent Deceleration.

That set of eight parameters was used to compare the St. Louis, New York City, and Los Angeles heavy-duty vehicle operating speed data, as discussed in Section 3.6. In addition to the above data, the number of miles traveled is also computed for each truck and for each data category.

```
011964INTERNATION3-S2       DELIVERY              DETROIT    06      6A110386D63104
LOCAL72705              393275SUPERIOR     400SIDNEY STLOUIS   MC 631040371        25
```

Table 2. ST. LOUIS VEHICLE NO. 1 - SPEED DENSITY AND DISTRIBUTION FUNCTIONS

SPEED	FREQUENCY	DENSITY	DISTRIBUTION	SPEED	FREQUENCY	DENSITY	DISTRIBUTION
ZERO	765	16.04		40	14	0.29	92.45
0	863	18.10	18.10	41	17	0.36	92.81
1	163	3.42	21.52	42	16	0.34	93.14
2	136	2.85	24.37	43	8	0.17	93.31
3	138	2.89	27.27	44	15	0.31	93.62
4	127	2.66	29.93	45	38	0.80	94.42
5	117	2.45	32.38	46	35	0.73	95.15
6	104	2.18	34.56	47	42	0.88	96.04
7	116	2.43	37.00	48	42	0.88	96.92
8	96	2.01	39.01	49	36	0.76	97.67
9	102	2.14	41.15	50	34	0.71	98.38
10	107	2.24	43.39	51	11	0.23	98.62
11	110	2.31	45.70	52	17	0.36	98.97
12	76	1.59	47.29	53	28	0.59	99.55
13	105	2.20	49.50	54	17	0.36	99.92
14	107	2.24	51.74	55	4	0.08	100.00
15	115	2.41	54.15	56	0	0.0	100.00
16	128	2.68	56.84	57	0	0.0	100.00
17	147	3.08	59.92	58	0	0.0	100.00
18	143	3.00	62.92	59	0	0.0	100.00
19	130	2.73	65.65	60	0	0.0	100.00
20	112	2.35	67.99	61	0	0.0	100.00
21	99	2.08	70.07	62	0	0.0	100.00
22	127	2.66	72.73	63	0	0.0	100.00
23	113	2.37	75.10	64	0	0.0	100.00
24	116	2.43	77.54	65	0	0.0	100.00
25	142	2.98	80.52	66	0	0.0	100.00
26	105	2.20	82.72	67	0	0.0	100.00
27	67	1.41	84.12	68	0	0.0	100.00
28	50	1.05	85.17	69	0	0.0	100.00
29	77	1.61	86.79	70	0	0.0	100.00
30	75	1.57	88.36	71	0	0.0	100.00
31	54	1.13	89.49	72	0	0.0	100.00
32	40	0.84	90.33	73	0	0.0	100.00
33	26	0.55	90.88	74	0	0.0	100.00
34	16	0.34	91.21	75	0	0.0	100.00
35	13	0.27	91.48	76	0	0.0	100.00
36	8	0.17	91.65	77	0	0.0	100.00
37	8	0.17	91.82	78	0	0.0	100.00
38	7	0.15	91.97	79	0	0.0	100.00
39	9	0.19	92.16	80	0	0.0	100.00

N = 4768
AVGE = 15.20
STD DEV = 13.77

```
41964INTERNATION3-S2        DELIVERY                CETROIT   06       6A110386C63104
LCCAL72705              393275SUPERICR      400SIDNEY STLOUIS    MC 631040371       25
```

Table 3. ST. LOUIS VEHICLE NO. 1 - INITIAL-SPEED-VERSUS-DELTA-SPEED MATRIX, 1-MPH SPEED INCREMENT

(N = 4761)

SPEED	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	803	49	8	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	40	71	29	13	7	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	10	33	45	27	18	3	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	2	13	21	58	25	16	3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	2	10	16	50	24	16	8	1	0	0	0	0	0	0
5	0	0	0	0	0	0	0	10	10	15	39	20	20	3	0	0	0	0	0	0	0
6	0	0	0	0	0	1	1	6	5	15	26	28	17	5	0	0	0	0	0	0	0
7	0	0	0	0	0	2	2	8	8	18	32	23	19	4	0	0	0	0	0	0	0
8	0	0	0	0	0	1	2	7	4	17	25	18	21	1	0	0	0	0	0	0	0
9	0	0	0	0	0	2	11	3	4	11	25	29	12	5	0	0	0	0	0	0	0
10	0	0	0	0	0	0	2	6	7	11	39	27	10	5	0	0	0	0	0	0	0
11	0	0	0	0	0	2	6	3	3	12	37	29	12	6	0	0	0	0	0	0	0
12	0	0	0	0	0	2	3	4	3	5	15	28	9	6	0	0	0	0	0	0	0
13	0	0	0	0	1	2	4	3	5	13	34	23	18	2	0	0	0	0	0	0	0
14	0	0	0	0	0	3	6	5	4	14	37	25	12	1	0	0	0	0	0	0	0
15	0	0	0	0	1	0	6	3	7	8	41	38	9	1	1	0	0	0	0	0	0
16	0	0	0	0	0	1	2	4	7	12	55	40	7	0	0	0	0	0	0	0	0
17	0	0	0	0	0	3	3	4	7	12	70	42	6	0	0	0	0	0	0	0	0
18	0	0	0	0	0	2	7	4	6	9	66	43	6	0	0	0	0	0	0	0	0
19	0	0	0	0	0	2	1	4	4	16	56	39	7	1	0	0	0	0	0	0	0
20	0	0	0	0	0	1	2	3	5	14	47	39	1	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	1	5	5	11	41	34	2	0	0	0	0	0	0	0	0
22	0	0	0	1	0	1	4	2	4	19	61	29	5	1	0	0	0	0	0	0	0
23	0	0	0	0	1	0	0	3	3	21	52	31	2	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	4	13	69	29	1	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	1	7	6	106	20	2	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	2	4	13	55	30	1	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	1	1	3	13	27	21	1	0	0	0	0	0	0	0	0
28	0	0	0	0	1	0	0	0	2	11	16	19	1	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	2	14	44	17	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	1	1	0	11	45	16	1	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	1	0	1	9	35	7	1	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	1	5	28	6	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	1	19	6	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	1	0	2	9	4	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	1	0	0	0	2	7	3	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	1	0	4	3	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	1	0	6	1	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	1	0	3	3	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	2	4	3	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	1	9	4	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	2	9	6	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	2	11	2	1	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	2	4	2	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	4	6	4	1	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	7	25	6	0	0	0	0	0	0	0	0	0

011964INTERNATION3-S2 DELIVERY DETROIT 06 6A110386063104
LOCAL72705 393275SUPERIOR 400SIDNEY STLOUIS MO 63104C371 25

Table 3. ST. LOUIS VEHICLE NO. 1 - INITIAL-SPEED-VERSUS-DELTA SPEED MATRIX, 1-MPH SPEED INCREMENT (Continued)

(N = 4761)

SPEED	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
46	0	0	0	0	0	0	0	0	0	8	19	7	1	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	3	33	6	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	5	29	8	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	3	30	3	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	1	31	2	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	1	9	1	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	1	12	4	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	2	23	3	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	1	15	1	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	1	4	26	66	97	161	509	2570	986	277	62	2	0	0	0	0	0	0

PERCENT OF TIME AT IDLE = 18.06
AVERAGE SPEED COMPUTED FROM MATRIX = 15.26
AVERAGE DELTA SPEED FOR POSITIVE VALUES = 1.31
AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.79

011964INTERNATION3-S2 DELIVERY CETROIT 06 6A110386063104
LCCAL72705 393275SUPERIOR 400SIDNEY STLOUIS MO 631040371 25

Table 4. ST. LOUIS VEHICLE NO. 1 - INITIAL-SPEED-VERSUS-DELTA-SPEED MATRIX, 5-MPH SPEED INCREMENT
(N = 4761)

SPEED	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	10	73	919	105	39	10	0	0	0	0	0	0	0
5	0	0	0	0	0	3	3	28	46	85	205	120	88	23	1	0	0	0	0	0	0
10	0	0	0	0	0	7	24	23	21	56	141	131	64	23	0	0	0	0	0	0	0
15	0	0	0	0	2	9	21	19	30	59	237	168	52	4	1	0	0	0	0	0	0
20	0	0	0	1	0	6	15	18	24	69	271	184	21	2	0	0	0	0	0	0	0
25	0	0	0	0	1	0	1	7	21	66	309	131	7	0	0	0	0	0	0	0	0
30	0	0	0	0	1	0	2	1	6	50	168	65	3	0	0	0	0	0	0	0	0
35	0	0	0	0	0	1	0	1	2	5	45	17	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	1	7	36	18	1	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	24	87	25	2	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	11	111	18	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	4	41	4	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	1	4	26	66	97	161	509	2570	986	277	62	2	0	0	0	0	0	0

PERCENT OF TIME AT IDLE = 24.28

AVERAGE SPEED COMPUTED FROM MATRIX = 15.23

AVERAGE DELTA SPEED FOR POSITIVE VALUES = 1.31

AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.79

3.2.3 Vehicle Stop Analysis

To complete the description of vehicle speed performance, an analysis of vehicle stops was conducted. Three types of stop were defined as follows:

1. Rolling Stop - Defined to be a deceleration to below 3 mph, followed by an acceleration to above 3 mph, all speeds in the sequence being less than 3 mph and nonzero except for single-zero speeds; i.e., zero speeds immediately preceded and followed by nonzero speeds.
2. Full Stop - Defined to be a stop where the vehicle speed is zero for two or more consecutive records and the engine is running.
3. Engine-Off Stop - Defined to be a full stop with the engine switched off.

Frequency, density, and distribution functions for each type of stop were computed for each vehicle. The computer output for each stop-type for Vehicle No. 1 is given in Tables 5, 6, and 7. It should be noted here that the output shown in Tables 2 to 7 resulted from a single pass of the data tapes. Total vehicle miles traveled was obtained by record-by-record integration of vehicle speed. In addition to the number of stops per truck and average time per stop, the average number of stops per mile was then computed. The computer output for one vehicle in each of the remaining axle type/fuel type categories is given in Appendix A.

A summary of the primary statistics of interest is shown for each vehicle in Table 8.

3.3 MATRIX DEVELOPMENT BY DATA CATEGORY

In order to put the accumulated St. Louis data into a form suitable for analysis of the impact of various operational parameters, matrices were derived for data categories based on the following parameters:

1. Range of operation
2. Fuel type
3. Axle configuration
4. Area type
5. Road type.

As shown in Table 9, this breakdown yielded 132 truck-data categories and 24 bus-data categories. The sample size, in units of seconds of operating time, is shown for each category in Table 9. It should be noted that 31 categories have zero sample sizes and an additional 27 categories have sample sizes less than 600. That is, about 37 percent of the 156 categories are represented by less than 10 minutes of operating time.

Speed, stop, and trip statistics are given by range in Table 10, where a trip is defined to extend from an engine-on time to the next engine-off time. The very long times per trip for the buses results from the fact that the engine is not normally turned off in the course of one chase. Note also that the total St. Louis data sample consists of 232 hours of operating data,

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011964INTERNATION3-S2      DELIVERY              DETROIT   06      6A112386063104
LOCAL72705              393275SUPERIOR    400SIDNEY STLOUIS   MO 631040371       25
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Table 5. ST. LOUIS VEHICLE NO. 1 - DISTRIBUTION OF ROLLING STOPS

SECONDS (UP TO)	FREQUENCY	DENSITY	DISTRIBUTION
1	6	24.00	24.00
2	5	20.00	44.00
3	6	24.00	68.00
4	2	8.00	76.00
5	1	4.00	80.00
6	2	8.00	88.00
7	1	4.00	92.00
8	0	0.0	92.00
9	1	4.00	96.00
10	0	0.0	96.00
11	0	0.0	96.00
12	0	0.0	96.00
13	1	4.00	100.00
14	0	0.0	100.00
15	0	0.0	100.00
16	0	0.0	100.00
17	0	0.0	100.00
18	0	0.0	100.00
19	0	0.0	100.00
20	0	0.0	100.00
22	0	0.0	100.00
24	0	0.0	100.00
26	0	0.0	100.00
28	0	0.0	100.00
30	0	0.0	100.00
32	0	0.0	100.00
34	0	0.0	100.00
36	0	0.0	100.00
38	0	0.0	100.00
40	0	0.0	100.00
42	0	0.0	100.00
44	0	0.0	100.00
46	0	0.0	100.00
48	0	0.0	100.00
50	0	0.0	100.00
52	0	0.0	100.00
54	0	0.0	100.00
56	0	0.0	100.00
58	0	0.0	100.00

MINUTES (UP TO)	FREQUENCY	DENSITY	DISTRIBUTION
1	0	0.0	100.00
2	0	0.0	100.00
3	0	0.0	100.00
4	0	0.0	100.00
5	0	0.0	100.00
6	0	0.0	100.00
7	0	0.0	100.00
8	0	0.0	100.00
9	0	0.0	100.00
10	0	0.0	100.00
11	0	0.0	100.00
12	0	0.0	100.00
13	0	0.0	100.00
14	0	0.0	100.00
15	0	0.0	100.00
20	0	0.0	100.00
25	0	0.0	100.00
30	0	0.0	100.00
35	0	0.0	100.00
40	0	0.0	100.00
45	0	0.0	100.00
50	0	0.0	100.00
55	0	0.0	100.00
60	0	0.0	100.00

NUMBER OF STOPS = 25
AVERAGE TIME/STOP = 3.52 SECONDS
TOTAL VEH. MILES = 20.19
AV. NO. STOPS/MILE = 1.24

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011964INTERNATION3-S2      DELIVERY              DETROIT   06      6A110356C63104
LCCAL72705           393275SUPERIOR    400SIDNEY STLOUIS   MO 631040371       25
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Table 6. ST. LOUIS VEHICLE NO. 1 - DISTRIBUTION OF FULL STOPS

SECONDS (UP TO)	FREQUENCY	DENSITY	DISTRIBUTION	MINUTES (UP TO)	FREQUENCY	DENSITY	DISTRIBUTION
1	6	9.52	9.52	1	0	0.0	100.00
2	8	12.70	22.22	2	0	0.0	100.00
3	9	14.29	36.51	3	0	0.0	100.00
4	1	1.59	38.10	4	0	0.0	100.00
5	1	1.59	39.68	5	0	0.0	100.00
6	2	3.17	42.86	6	0	0.0	100.00
7	1	1.59	44.44	7	0	0.0	100.00
8	2	3.17	47.62	8	0	0.0	100.00
9	2	3.17	50.79	9	0	0.0	100.00
10	2	3.17	53.97	10	0	0.0	100.00
11	2	3.17	57.14	11	0	0.0	100.00
12	1	1.59	58.73	12	0	0.0	100.00
13	2	3.17	61.90	13	0	0.0	100.00
14	4	6.35	68.25	14	0	0.0	100.00
15	3	4.76	73.02	15	0	0.0	100.00
16	0	0.0	73.02	20	0	0.0	100.00
17	5	7.94	80.95	25	0	0.0	100.00
18	0	0.0	80.95	30	0	0.0	100.00
19	1	1.59	82.54	35	0	0.0	100.00
20	2	3.17	85.71	40	0	0.0	100.00
22	2	3.17	88.89	45	0	0.0	100.00
24	3	4.76	93.65	50	0	0.0	100.00
26	0	0.0	93.65	55	0	0.0	100.00
28	0	0.0	93.65	60	0	0.0	100.00
30	0	0.0	93.65	65	0	0.0	100.00
32	1	1.59	95.24	70	0	0.0	100.00
34	0	0.0	95.24	75	0	0.0	100.00
36	2	3.17	98.41	80	0	0.0	100.00
38	0	0.0	98.41	85	0	0.0	100.00
40	0	0.0	98.41	90	0	0.0	100.00
42	1	1.59	100.00	95	0	0.0	100.00
44	0	0.0	100.00	100	0	0.0	100.00
46	0	0.0	100.00	105	0	0.0	100.00
48	0	0.0	100.00	110	0	0.0	100.00
50	0	0.0	100.00	115	0	0.0	100.00
52	0	0.0	100.00	120	0	0.0	100.00
54	0	0.0	100.00	125	0	0.0	100.00
56	0	0.0	100.00	130	0	0.0	100.00
58	0	0.0	100.00	135	0	0.0	100.00

```
NUMBER OF STOPS      =    63
AVERAGE TIME/STOP    =  10.98   SECONDS
TOTAL VEH. MILES     =  20.19
AV. NO. STOPS/MILE   =   3.12
```

```
C11964INTERNATION3-S2      DELIVERY              DETROIT   06       6A113386063104
LCCAL72705            393275SUPERIOR    400SIDNEY STLOUIS   MC 631040371 ·     25
```

Table 7. ST. LOUIS VEHICLE NO. 1 - DISTRIBUTION OF ENGINE-OFF STOPS

MINUTES (UP TO)	FREQUENCY	DENSITY	DISTRIBUTION
1	0	0.0	0.0
2	0	0.0	0.0
3	1	20.00	20.00
4	0	0.0	20.00
5	0	0.0	20.00
6	0	0.0	20.00
7	0	0.0	20.00
8	0	0.0	20.00
9	0	0.0	20.00
10	0	0.0	20.00
15	0	0.0	20.00
20	1	20.00	40.00
25	0	0.0	40.00
30	1	20.00	60.00
35	0	0.0	60.00
40	0	0.0	60.00
45	0	0.0	60.00
50	0	0.0	60.00
55	0	0.0	60.00
60	0	0.0	60.00
75	0	0.0	60.00
90	0	0.0	60.00
105	1	20.00	80.00
120	0	0.0	80.00
135	0	0.0	80.00
150	0	0.0	80.00
165	0	0.0	80.00
180	0	0.0	80.00
195	0	0.0	80.00
210	1	20.00	100.00
225	0	0.0	100.00
240	0	0.0	100.00
300	0	0.0	100.00
360	0	0.0	100.00
420	0	0.0	100.00
480	0	0.0	100.00

```
NUMBER OF STOPS      =      5
AVERAGE TIME/STOP    =  71.05  MINUTES
TOTAL VEH. MILES     =  20.19
AV. NO. STOPS/MILE   =   0.25
```

Table 8. VEHICLE SUMMARY

VEHICLE	TYPE	AVERAGE SPEED, (mph)	VEHICLE MILES TRAVELED	PERCENT IDLE TIME	AVERAGE ACCEL, (mph/sec)	AVERAGE DECEL, (mph/sec)	ENG-OFF STOPS PER DAY	AVG. TIME PER STOP (Minutes)
1	TT-DSL	15.26	20.19	18.06	1.31	-1.79	5	71.05
2	BUS	42.49	296.26	12.85	1.25	-1.34	0	0.00
3	3SU-DSL	10.51	84.25	67.02	1.19	-1.35	1	54.62
4	2SU-GAS	24.39	42.43	23.15	1.65	-1.78	3	5.56
5	TT-GAS	3.01	14.27	85.88	1.59	-1.84	9	19.95
6	TT-GAS	22.17	58.42	31.92	1.33	-1.54	5	56.42
7	2SU-GAS	26.19	74.73	12.72	1.47	-1.61	14	13.93
8	BUS	11.12	55.82	39.20	1.82	-2.31	2	6.57
9	2SU-GAS	29.62	110.02	8.61	1.49	-1.68	10	52.25
10	2SU-GAS	27.90	53.65	2.12	1.26	-1.42	24	12.67
11	TT-GAS	26.98	74.61	11.58	1.42	-1.78	14	24.87
12	TT-GAS	15.77	26.19	32.89	1.50	-1.69	11	30.70
13	2SU-GAS	19.44	26.80	9.79	1.43	-1.78	15	23.09
14	2SU-GAS	27.73	61.84	9.42	1.40	-1.74	9	16.31
15	2SU-GAS	13.58	29.94	15.09	1.59	-1.70	20	8.76
16	2SU-GAS	31.38	76.77	8.98	1.48	-1.80	14	24.29
17	2SU-GAS	8.43	38.46	65.43	1.55	-1.82	4	5.61
18	2SU-GAS	24.61	24.65	5.49	1.55	-1.69	18	14.32
19	BUS	11.04	41.30	31.58	1.87	-2.14	1	9.58
20	TT-DSL	31.06	76.01	5.99	1.23	-1.28	13	23.83
21	TT-GAS	22.61	108.91	41.31	1.09	-1.25	2	79.99
22	TT-DSL	46.99	208.15	17.56	1.04	-1.11	0	0.00
23	2SU-DSL	14.28	24.50	24.82	1.75	-1.86	12	27.99
24	2SU-DSL	34.39	134.04	9.23	1.39	-1.73	17	16.42

Table 8. VEHICLE SUMMARY (Continued)

VEHICLE	TYPE	AVERAGE SPEED, (mph)	VEHICLE MILES TRAVELED	PERCENT IDLE TIME	AVERAGE ACCEL, (mph/sec)	AVERAGE DECEL, (mph/sec)	ENG-OFF STOPS PER DAY	AVG. TIME PER STOP (Minutes)
25	TT-DSL	53.31	500.79	7.38	1.05	-1.12	3	32.03
26	TT-DSL	17.41	37.10	27.63	1.43	-1.79	10	34.20
27	3SU-DSL	29.85	104.72	6.55	1.17	-1.46	6	26.77
28	BUS	38.54	249.48	16.74	1.21	-1.30	0	0.00
29	TT-DSL	49.16	104.95	6.90	1.08	-1.19	0	0.00
30	TT-DSL	56.04	209.99	1.28	1.09	-1.25	3	18.53
31	TT-DSL	38.66	160.92	1.76	1.17	-1.25	7	31.05
32	2SU-GAS	35.78	73.22	9.91	1.83	-1.94	12	12.31
33	2SU-GAS	37.85	52.00	9.77	1.51	-1.78	15	22.28
34	2SU-GAS	18.65	29.30	12.47	1.55	-1.72	15	19.80
35	2SU-GAS	17.06	42.98	15.59	1.56	-1.85	25	12.44
36	2SU-GAS	27.41	35.61	8.68	1.43	-1.64	8	34.66
37	TT-DSL	49.45	220.32	2.19	1.09	-1.20	2	53.23
38	BUS	39.42	244.29	16.76	1.24	-1.34	0	0.00
39	2SU-GAS	22.15	56.53	10.70	1.50	-1.74	21	12.57
40	3SU-DSL	10.02	49.16	51.07	1.41	-1.71	13	2.95
41	2SU-GAS	33.22	45.69	6.26	1.57	-1.85	14	23.39
42	2SU-GAS	7.79	38.97	64.23	1.52	-1.79	1	2.50
43	2SU-GAS	27.56	42.15	4.61	1.38	-1.58	16	15.52
44	2SU-GAS	26.38	58.85	8.89	1.48	-1.61	10	15.13
45	2SU-GAS	18.09	47.36	12.99	1.62	-1.74	27	6.86
46	TT-DSL	50.09	216.06	2.87	1.04	-1.12	1	45.60
47	TT-DSL	40.61	117.61	2.83	1.22	-1.55	4	39.00
48	2SU-GAS	17.43	39.47	16.15	1.58	-1.93	21	10.45

Table 8. VEHICLE SUMMARY (Continued)

VEHICLE	TYPE	AVERAGE SPEED, (mph)	VEHICLE MILES TRAVELED	PERCENT IDLE TIME	AVERAGE ACCEL, (mph/sec)	AVERAGE DECEL, (mph/sec)	ENG-OFF STOPS PER DAY	AVG. TIME PER STOP (Minutes)
49	TT-GAS	24.61	159.76	34.92	1.32	-1.58	15	10.62
50	2SU-GAS	36.16	94.94	12.25	1.49	-1.69	15	11.54
51	2SU-GAS	36.10	45.83	10.53	1.45	-1.61	5	68.63
52	3SU-GAS	25.07	36.00	1.26	1.36	-1.44	11	13.21
53	2SU-GAS	22.17	68.77	33.95	1.42	-1.64	4	24.84
54	3SU-GAS	29.58	113.60	6.05	1.23	-1.56	9	24.22
55	2SU-GAS	15.03	38.51	12.66	1.56	-1.76	30	11.18
56	2SU-GAS	5.40	24.23	72.35	1.37	-1.65	12	12.33
57	3SU-DSL	10.62	56.08	50.99	1.30	-1.52	0	0.00
58	TT-DSL	26.62	80.50	20.71	1.24	-1.40	4	52.41
59	3SU-GAS	41.97	139.46	1.56	1.15	-1.29	12	27.35
60	2SU-GAS	16.83	34.48	12.09	1.53	-1.52	12	23.85
61	3SU-GAS	20.58	41.82	28.23	1.27	-1.42	13	17.76
62	TT-DSL	47.07	67.46	3.39	1.07	-1.16	0	0.00
63	2SU-GAS	28.38	76.25	6.60	1.36	-1.50	11	24.51
64	TT-DSL	45.39	241.56	2.25	1.18	-1.26	10	18.58
65	3SU-GAS	7.16	40.26	75.88	1.23	-1.39	1	4.52
66	TT-DSL	49.61	170.92	1.22	1.17	-1.34	3	58.32
67	2SU-DSL	29.55	79.88	11.33	1.68	-2.09	22	11.98
68	2SU-GAS	31.28	105.16	23.32	1.25	-1.56	9	18.24
69	3SU-GAS	33.00	123.28	6.48	1.44	-1.83	21	18.60
70	TT-DSL	54.31	163.63	0.20	1.08	-1.10	2	4.31
OVERALL		28.18	6542.11	2.60	1.18	-1.37	9.69	21.82

Table 9. DATA CATEGORY SAMPLE SIZES

RANGE OF OPERATIONAL	FUEL TYPE	AXLE CONFIG.	AREA 1			AREA 2			AREA 3			AREA 4		
			Road Type 1	Road Type 2	Road Type 3	Road Type 1	Road Type 2	Road Type 3	Road Type 1	Road Type 2	Road Type 3	Road Type 1	Road Type 2	Road Type 3
Local	Gas	2 S.U.	77	8,671	2,113	10,822	54,428	18,040	10,885	28,653	11,366	13,301	34,374	38,543
		3 S.U.	0	0	0	1,898	443	50	2,123	4,533	634	2,966	17,215	16,683
		TT	13	462	56	1,846	14,292	9,788	952	4,750	853	0	0	0
	Diesel	2 S.U.	0	202	0	816	9,050	1,147	997	2,371	871	797	805	52
		3 S.U.	69	2,159	55	2,017	12,805	3,846	1,949	3,248	7,459	6,044	15,078	23,418
		TT	87	296	0	1,942	8,021	8,613	905	1	0	1,574	480	0
Short	Gas	2 S.U.	0	0	0	329	694	0	2,138	7,958	2,707	7.518	13,803	8,456
		3 S.U.	0	0	0	847	669	24	659	4,515	710	10,869	5,800	1,316
		TT	0	327	6,180	1,782	3,220	1,003	975	2,893	609	8,428	7,932	7,361
	Diesel	TT	0	0	0	3,463	5,847	203	4,330	10,750	3,902	46,375	15,478	2,362
Long	Diesel	TT	0	59	0	4,875	4,875	181	2,063	189	128	84,074	6,746	43
Bus-Transit			0	8,586	261	0	13,292	5,406	0	2,402	1,600	0	0	0
Bus-Express			77	352	16	2,462	5,358	0	1,494	10,164	3,372	5,722	28,459	13,241

Table 10. STATISTICS BY RANGE

RANGE	TIME (SECONDS)	AVERAGE SPEED (MPH)	ENGINE-OFF STOPS	TIME PER TRIP (MINUTES)
Local	428,006	18.69	542	13.16
Short	202,425	34.89	183	18.44
Long	102,476	51.68	16	106.75
Transit Bus	31,547	11.08	5	105.16
Express Bus	70,717	40.22	3	392.87
Overall	835,171	28.20	749	18.58

Table 11. SPEED STATISTICS BY AREA

AREA CODE	AREA TYPE	TIME (SECONDS)	AVERAGE SPEED (MPH)
1	Urban	30,118	7.63
2	Urban	213,639	19.31
3	Nonurban	146,101	24.68
4	Nonurban	445,313	35.01
	Overall	835,171	28.20

for an average of 3.314 hours of data per vehicle. Average speeds by area are shown in Table 11. Stop and trip-time statistics cannot be computed here, of course, because a single trip can consist of operation in more than one area. The average speeds shown in Tables 10 and 11 are based on combined freeway and nonfreeway data.

Because of the paucity of data in 37 percent of the data categories in Table 9, the 156 categories were then combined by matrix addition into the 32 categories shown in Table 12. The sample sizes in seconds of operating time for each category are also shown in Table 12. Matrices and the associated statistics were generated for each of the 188 categories described above and delivered to the EPA in printed form and on magnetic tape.

3.4 CATEGORY ANALYSIS

Each of the 32 matrices based on the categories shown in Table 12 was a combination of 2 or more (up to 12) of the matrices developed for the 156 categories of Table 3. To determine if a further combining of categories, hence matrices, should be accomplished, a category analysis was performed by the EPA using statistics computed by Olson. The analysis consisted essentially of comparing matrices within categories and between categories with a difference measure, D, created by subtracting corresponding cells of a given pair of normalized matrices, squaring the difference, and summing the squares over all cells.

Thus,

$$D = \sum (A_{ij} - B_{ij})^2,$$

where A_{ij} and B_{ij} are the corresponding cell percentages of matrices A and B.

The matrices were first normalized to percent frequency of occurrence to avoid the irrelevant contribution to D which results from the great disparity in many of the sample sizes.

To illustrate the procedure, consider the category in Table 12 defined by 2 S.U. Gas Trucks operating on Road Type 1 (Freeway) in Areas 1 and 2 (Urban). The matrix for that category is the sum of the matrices corresponding to the following four data categories of Table 9:

1. Local, Gas, 2 S.U., Area 1, Road Type 1
2. Local, Gas, 2 S.U., Area 2, Road Type 1
3. Short, Gas, 2 S.U., Area 1, Road Type 1
4. Short, Gas, 2 S.U., Area 2, Road Type 1.

A value of D was computed for each combination of two of the four matrices, for a total of six comparisons or six D values. That procedure was followed for each of the 32 categories of Table 12 except, of course, for the 2 Transit-Bus categories for which there are no freeway data.

A D value was then computed for each pair of the 30 nonzero matrices corresponding to the data categories of Table 12, for a total of 435 D-value comparisons. The D values for the within-category and between-category comparisons were then forwarded to the EPA, in a matrix format, for further study.

Table 12. COMBINED DATA CATEGORY SAMPLE SIZES

FUEL TYPE	AXLE CONFIG.	AREA 1 + AREA 2		AREA 3 + AREA 4	
		Road Type 1	Road Type 2 + Road Type 3	Road Type 1	Road Type 1 + Road Type 3
Gas	2 S.U.	11,228	83,946	33,842	145,853
	3 S.U.	2,745	1,186	16,617	51,406
	TT	3,641	35,328	10,355	24,398
Diesel	2 S.U.	816	10,399	1,794	4,099
	3 S.U.	2,086	18,867	7,993	49,203
	TT	10,367	27,338	139,321	40,079
Bus-Transit		0	27,545	0	4,002
Bus-Express		2,539	5,726	7,216	55,236

After examination of the matrices, the D values, average speeds, stop distributions, and sample sizes, the Project Officer concluded that the data categories could be combined further.

The matrices corresponding to Table 9 were then combined, again by matrix addition, into the data categories shown in Table 13, where the sample sizes are again in units of seconds of operating time.

In anticipation of the final task, the comparison of the St. Louis data sample with the CAPE-21 New York and Los Angeles data samples, the set of final categories shown in Table 14 was created. Each time that categories were combined, the resulting matrices and associated statistics were generated and forwarded to the Project Officer. The matrices for the Table 14 categories are given in Appendix A.

3.5 GENERATION OF DRIVING CYCLES

After continued analysis of all of the matrices and associated statistics, it was concluded that all truck types had similar speed patterns. This finding is not unexpected since the driving pattern of any vehicle is constrained primarily by stoplights, stopsigns, speed limits, and the number of lanes; i.e., the pattern is primarily a function of road characteristics. Truck type is thus of secondary importance to operational speed patterns. A considerable difference is found, however, between freeway and nonfreeway operating patterns because of the large difference in average speed due to the differences in road characteristics. Finally, analysis of the CAPE-21 speed data also indicated axle type and fuel type were not of primary importance.

Based on these considerations, driving cycles were generated for five data categories. These categories, together with a set of overall descriptive statistics, are shown in Table 15 for combines urban and non urban operation.

The duration of the desired cycles was established to be compatible with the duration of the chassis cycles developed from the CAPE-21 data. Ten-minute cycles had been developed for the Los Angeles and New York data categories. These could then be combined into 20-minute cycles to represent what was assumed to be the two extremes of heavy-duty vehicle operation. Therefore, 10-minute cycles were generated for each of the five data categories shown in Table 15. In addition, 20-minute cycles were generated for the two freeway categories to provide data of interest to studies of fuel consumption at the EPA and SAE.

3.5.1 Cycle-Generation Procedure

The cycles were generated on a second-by-second basis using a Monte Carlo technique described below and in References 2 and 3. In those references the cycles were generated on a mode-by-mode basis; where a mode is defined by an initial speed, a final speed, and a time in mode. For the present study, the cycles were generated second-by-second, using the initial-speed-versus-delta-speed matrix as the basis.

Each row of the input matrix is first normalized by summing the individual frequencies in that row and then dividing each cell frequency in the row by

Table 13. RECOMBINED DATA CATEGORY SAMPLE SIZES

RANGE	FUEL TYPE	FREEWAY	NONFREEWAY
Local	Gas	44,883	265,947
	Diesl	17,197	99,979
Short	Gas	33,545	76,170
	Diesel	54,168	38,542
Long	Diesel	91,012	11,464
Bus-Transit		0	31,547
Bus-Express		9,755	60,962

Table 14. FINAL DATA CATEGORY SAMPLE SIZES

VEHICLES		FREEWAY	NONFREEWAY
Trucks	GAS	78,428	342,117
	Diesel	162,377	149,985
All Trucks		240,805	492,102
All Buses		9,755	92,509

Table 15. STATISTICS FOR DRIVING CYCLE CATEGORIES

VEHICLE CATEGORY	AVERAGE SPEED (MPH)	PERCENT IDLE	PERCENT CRUISE[a]	PERCENT ACCEL.	PERCENT DECEL.
All Trucks (Freeway)	53.01	0.02	72.40	15.64	11.94
All Trucks (Nonfreeway)	15.68	34.19	27.93	21.17	16.71
Express Buses (Freeway)	55.25	1.28	62.18	19.14	17.40
Express Buses (Nonfreeway)	37.81	17.44	40.99	22.95	18.62
Transit Buses (Nonfreeway)	11.08	34.05	15.72	28.19	22.04

[a] Does not include percent idle.

the row total. Each cell entry in the matrix is then an empirical transition probability. That is, each row is identified by an initial speed and each cell entry is the conditional probability of the indicated delta speed given the indicated initial speed.

Each row is thus a probability density function which is then converted to a distribution function by summing across the row. That matrix of distribution functions, called the transition-probability matrix, is then all that is needed to generate cycles using the Monte Carlo technique. To illustrate the procedure, Table 16 shows the initial-speed-versus-deltaspeed matrix for the Express Buses operating on nonfreeway roads, and Table 17 shows the corresponding transition-probability matrix. (Note that the delta-speed range is now ±4 mph per second, reflecting the fact that there exist very few points outside of that range and also for compatibility with the CAPE-21 cycles which are also restricted to that range. The remainder of the matrices used to generate the cycles and the corresponding transition-probability matrices are given in Appendix B.)

Consider the row with zero initial speed in Table 16. The total frequency is 10,737 which, when divided into each of the frequencies in that row, yields the conditional probability densities: 0, 0, 0, 0, 0.98994, 0.00661, 0.00233, 0.00019, and 0.00093. The probability distribution function created by taking a running sum of the probability densities is thus: 0, 0, 0, 0, 0.9899, 0.9966, 0.9989, 0.9991, and 1.000, which is the first row of Table 17.

Suppose the cycle is to start with an idle (or zero initial speed). A random number, uniformly distributed on the unit interval, is generated. The distribution function for the first row of the matrix (initial speed equal to zero) must contain some value which is the first value to be greater than the random number. That value thus corresponds to a randomly-selected value of delta speed by virtue of the matrix indexing. The value of delta speed is added to the initial-speed value to yield a next speed one second of time later. That speed then becomes the initial speed for another Monte Carlo selection of a new delta speed. This process continues until the desired cycle duration has been reached.

For example, suppose the initial speed is 35 mph and a random number is generated with the value 0.1638. From Table 17 it is determined that a delta speed of -1 mph per second has been selected, since $0.0635 < 0.1638 < 0.2293$. The new initial speed is thus 35 mph minus 1 mph, or 34 mph. If the next random number generated has the value 0.8361, then from Table 17, it is determined that the next delta speed is 0 mph per second. The new initial speed is thus 34 mph again.

As each cycle is generated, an initial-speed-versus-delta-speed matrix is created from the cycle data. Statistics are then computed from the cycle matrix for comparison with the corresponding statistics computed from the input matrix. If these statistics are sufficiently close, as discussed below, the cycle is said to be representative. The statistics for representative cycles are stored in the computer and printed at the end of the run, while those for nonrepresentative cycles are erased in preparation for generating the next cycle.

Table 16. . INITIAL SPEED VS DELTA SPEED: ST. LOUIS EXPRESS BUSES, NONFREEWAY

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
0	0	0	0	0	10629	71	25	2	10	10737
1	0	0	0	61	73	40	31	25	3	233
2	0	0	35	53	44	31	18	20	10	211
3	0	10	42	50	48	37	21	27	8	243
4	1	6	37	54	91	37	35	24	13	298
5	5	14	36	63	81	55	21	19	12	306
6	6	21	40	61	76	54	38	27	13	336
7	8	14	51	59	84	42	24	32	10	324
8	6	13	42	55	84	38	32	19	16	305
9	10	16	38	62	44	37	35	26	13	281
10	16	17	38	51	54	38	36	30	14	294
11	12	18	30	65	72	27	34	16	9	283
12	11	19	36	45	41	38	33	25	11	259
13	11	13	35	34	43	44	35	24	5	244
14	16	16	39	37	38	41	26	17	10	240
15	13	18	26	41	46	53	41	15	12	265
16	13	18	35	44	66	51	33	17	1	278
17	7	24	28	39	71	63	42	11	4	289
18	13	20	32	34	75	75	30	17	1	297
19	13	12	35	34	72	81	43	11	4	305
20	10	15	43	39	94	92	34	10	3	340
21	5	15	24	43	68	88	44	9	1	297
22	9	18	38	41	63	79	47	6	1	302
23	10	13	22	53	80	75	43	11	1	308
24	10	19	40	53	103	92	40	7	1	365
25	2	12	28	62	116	95	44	11	0	370
26	8	19	22	73	121	91	40	5	0	379
27	12	11	31	78	123	91	40	10	0	396
28	13	8	20	74	186	104	46	5	0	456
29	1	14	26	77	202	107	35	3	0	465
30	4	12	12	80	189	113	21	6	0	437
31	5	10	28	79	206	134	27	3	0	492
32	6	11	23	76	171	136	21	2	0	446
33	6	6	20	85	218	143	32	6	0	516
34	4	10	22	92	226	143	24	2	0	523
35	2	9	25	94	247	166	24	0	0	567
36	4	9	18	84	273	165	28	0	0	581
37	3	9	23	101	258	174	21	2	0	591
38	4	11	17	118	310	165	23	1	0	649
39	4	3	16	106	340	159	18	0	0	646
40	2	10	21	105	305	145	27	1	0	616

Table 16. INITIAL SPEED VS DELTA SPEED: ST. LOUIS EXPRESS BUSES, NONFREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
41	2	8	10	108	326	179	17	1	0	651
42	2	3	26	124	367	187	17	1	0	727
43	3	11	15	122	487	210	20	2	0	870
44	4	4	27	131	367	238	37	1	0	809
45	3	2	29	170	424	250	21	0	0	899
46	3	5	20	205	474	247	12	4	0	970
47	3	4	24	178	636	276	27	0	0	1148
48	2	5	18	220	745	303	19	0	0	1312
49	2	3	24	241	784	311	22	1	0	1388
50	1	2	33	228	793	315	17	2	0	1391
51	0	0	28	238	758	333	37	1	0	1395
52	2	1	20	263	726	351	35	0	0	1398
53	1	1	34	278	804	328	19	3	0	1468
54	2	2	24	262	777	367	39	2	0	1475
55	2	1	17	288	756	401	57	0	0	1522
56	0	2	38	345	840	426	22	1	0	1674
57	2	4	38	325	971	349	16	0	0	1705
58	0	2	22	260	1070	350	12	0	0	1716
59	1	2	14	291	1071	317	4	0	0	1700
60	0	2	9	234	1241	287	10	0	0	1783
61	0	1	7	208	1171	266	9	0	0	1662
62	0	0	9	193	922	345	23	0	0	1492
63	0	0	14	258	671	322	19	1	0	1285
64	0	1	23	267	602	216	11	0	0	1120
65	1	0	12	142	444	176	28	0	0	803
66	0	0	12	152	296	186	18	0	0	664
67	1	0	23	166	227	114	3	0	0	534
68	0	1	5	94	245	65	0	0	0	410
69	0	0	3	41	344	44	2	0	0	434
70	0	0	1	31	148	36	1	0	0	217
71	0	1	0	18	94	28	2	0	0	143
72	0	0	1	22	67	19	1	0	0	110
73	0	0	0	11	92	15	0	0	0	118
74	0	0	1	13	72	14	0	0	0	100
75	0	0	1	3	34	6	0	0	0	44
76	0	0	0	6	21	2	0	0	0	29
77	0	0	0	2	15	2	0	0	0	19
78	0	0	0	1	5	1	0	0	0	7
79	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
TOTALS	322	581	1756	8694	35618	11392	1889	524	186	60962

Table 17. TRANSITION PROBABILITY MATRIX: ST. LOUIS EXPRESS BUSES, NONFREEWAY

	-4	-3	-2	-1	0	1	2	3	4
0	0.0	0.0	0.0	0.0	0.9899	0.9966	0.9989	0.9991	1.0000
1	0.0	0.0	0.0	0.2618	0.5751	0.7468	0.8798	0.9871	1.0000
2	0.0	0.0	0.1659	0.4171	0.6256	0.7725	0.8578	0.9526	1.0000
3	0.0	0.0412	0.2140	0.4198	0.6173	0.7695	0.8560	0.9671	1.0000
4	0.0034	0.0235	0.1477	0.3209	0.6342	0.7584	0.8758	0.9564	1.0000
5	0.0163	0.0621	0.1797	0.3856	0.6503	0.8301	0.8987	0.9608	1.0000
6	0.0179	0.0804	0.1994	0.3810	0.6071	0.7679	0.8810	0.9613	1.0000
7	0.0247	0.0679	0.2253	0.4074	0.6667	0.7963	0.8704	0.9691	1.0000
8	0.0197	0.0623	0.2000	0.3803	0.6557	0.7803	0.8852	0.9475	1.0000
9	0.0356	0.0925	0.2278	0.4484	0.6050	0.7367	0.8612	0.9537	1.0000
10	0.0544	0.1122	0.2415	0.4150	0.5986	0.7279	0.8503	0.9524	1.0000
11	0.0424	0.1060	0.2120	0.4417	0.6561	0.7915	0.9117	0.9682	1.0000
12	0.0425	0.1158	0.2548	0.4286	0.5869	0.7336	0.8610	0.9575	1.0000
13	0.0451	0.0984	0.2418	0.3811	0.5574	0.7377	0.8811	0.9795	1.0000
14	0.0667	0.1333	0.2958	0.4500	0.6083	0.7792	0.8875	0.9583	1.0000
15	0.0491	0.1170	0.2151	0.3698	0.5434	0.7434	0.8981	0.9547	1.0000
16	0.0468	0.1115	0.2374	0.3957	0.6331	0.8165	0.9353	0.9964	1.0000
17	0.0242	0.1073	0.2042	0.3391	0.5848	0.8028	0.9481	0.9862	1.0000
18	0.0438	0.1111	0.2189	0.3333	0.5859	0.8384	0.9394	0.9966	1.0000
19	0.0426	0.0820	0.1967	0.3082	0.5443	0.8098	0.9508	0.9869	1.0000
20	0.0294	0.0735	0.2000	0.3147	0.5912	0.8618	0.9618	0.9912	1.0000
21	0.0168	0.0673	0.1481	0.2929	0.5219	0.8182	0.9663	0.9966	1.0000
22	0.0258	0.0894	0.2152	0.3510	0.5596	0.8212	0.9763	0.9967	1.0000
23	0.0325	0.0747	0.1461	0.3182	0.5779	0.8214	0.9610	0.9968	1.0000
24	0.0274	0.0795	0.1890	0.3342	0.6164	0.8685	0.9781	0.9973	1.0000
25	0.0054	0.0378	0.1135	0.2811	0.5946	0.8514	0.9703	1.0000	1.0000
26	0.0211	0.0712	0.1293	0.3219	0.6412	0.8813	0.9868	1.0000	1.0000
27	0.0303	0.0581	0.1364	0.3333	0.6439	0.8737	0.9747	1.0000	1.0000
28	0.0285	0.0461	0.0899	0.2522	0.6601	0.8882	0.9890	1.0000	1.0000
29	0.0022	0.0323	0.0882	0.2538	0.6882	0.9183	0.9935	1.0000	1.0000
30	0.0092	0.0366	0.0641	0.2471	0.6796	0.9382	0.9863	1.0000	1.0000
31	0.0102	0.0305	0.0874	0.2480	0.6667	0.9390	0.9939	1.0000	1.0000
32	0.0135	0.0381	0.0897	0.2601	0.6435	0.9484	0.9955	1.0000	1.0000
33	0.0116	0.0233	0.0620	0.2267	0.6492	0.9264	0.9884	1.0000	1.0000
34	0.0076	0.0268	0.0688	0.2447	0.6769	0.9503	0.9962	1.0000	1.0000
35	0.0035	0.0194	0.0635	0.2293	0.6649	0.9577	1.0000	1.0000	1.0000
36	0.0069	0.0224	0.0534	0.1979	0.6678	0.9518	1.0000	1.0000	1.0000
37	0.0051	0.0203	0.0592	0.2301	0.6667	0.9611	0.9966	1.0000	1.0000
38	0.0062	0.0231	0.0493	0.2311	0.7088	0.9630	0.9985	1.0000	1.0000
39	0.0062	0.0108	0.0356	0.1997	0.7260	0.9721	1.0000	1.0000	1.0000
40	0.0032	0.0155	0.0536	0.2240	0.7192	0.9545	0.9984	1.0000	1.0000

Table 17. TRANSITION PROBABILITY MATRIX: ST. LOUIS EXPRESS BUSES, NONFREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4
41	0.0031	0.0154	0.0307	0.1966	0.6974	0.9724	0.9985	1.0000	1.0000
42	0.0028	0.0069	0.0426	0.2132	0.7180	0.9752	0.9986	1.0000	1.0000
43	0.0034	0.0161	0.0333	0.1736	0.7333	0.9747	0.9977	1.0000	1.0000
44	0.0049	0.0099	0.0433	0.2052	0.6588	0.9530	0.9988	1.0000	1.0000
45	0.0033	0.0056	0.0378	0.2269	0.6986	0.9766	1.0000	1.0000	1.0000
46	0.0031	0.0082	0.0289	0.2402	0.7289	0.9835	0.9959	1.0000	1.0000
47	0.0026	0.0061	0.0270	0.1821	0.7361	0.9765	1.0000	1.0000	1.0000
48	0.0015	0.0053	0.0191	0.1867	0.7546	0.9855	1.0000	1.0000	1.0000
49	0.0014	0.0036	0.0209	0.1945	0.7594	0.9834	0.9993	1.0000	1.0000
50	0.0007	0.0022	0.0259	0.1898	0.7599	0.9863	0.9986	1.0000	1.0000
51	0.0	0.0	0.0201	0.1907	0.7341	0.9728	0.9993	1.0000	1.0000
52	0.0014	0.0021	0.0165	0.2046	0.7239	0.9750	1.0000	1.0000	1.0000
53	0.0007	0.0014	0.0245	0.2139	0.7616	0.9850	0.9980	1.0000	1.0000
54	0.0014	0.0027	0.0190	0.1966	0.7234	0.9722	0.9986	1.0000	1.0000
55	0.0013	0.0020	0.0131	0.2024	0.6991	0.9625	1.0000	1.0000	1.0000
56	0.0	0.0012	0.0239	0.2300	0.7318	0.9863	0.9994	1.0000	1.0000
57	0.0012	0.0035	0.0258	0.2164	0.7859	0.9906	1.0000	1.0000	1.0000
58	0.0	0.0012	0.0140	0.1655	0.7890	0.9930	1.0000	1.0000	1.0000
59	0.0006	0.0018	0.0100	0.1812	0.8112	0.9976	1.0000	1.0000	1.0000
60	0.0	0.0011	0.0062	0.1374	0.8334	0.9944	1.0000	1.0000	1.0000
61	0.0	0.0006	0.0048	0.1300	0.8345	0.9946	1.0000	1.0000	1.0000
62	0.0	0.0	0.0060	0.1354	0.7534	0.9846	1.0000	1.0000	1.0000
63	0.0	0.0	0.0109	0.2117	0.7339	0.9844	0.9992	1.0000	1.0000
64	0.0	0.0009	0.0214	0.2598	0.7973	0.9902	1.0000	1.0000	1.0000
65	0.0012	0.0012	0.0162	0.1930	0.7460	0.9651	1.0000	1.0000	1.0000
66	0.0	0.0	0.0181	0.2470	0.6928	0.9729	1.0000	1.0000	1.0000
67	0.0019	0.0019	0.0449	0.3558	0.7809	0.9944	1.0000	1.0000	1.0000
68	0.0	0.0024	0.0146	0.2439	0.8415	1.0000	1.0000	1.0000	1.0000
69	0.0	0.0	0.0069	0.1014	0.8940	0.9954	1.0000	1.0000	1.0000
70	0.0	0.0	0.0046	0.1475	0.8295	0.9954	1.0000	1.0000	1.0000
71	0.0	0.0070	0.0070	0.1329	0.7902	0.9860	1.0000	1.0000	1.0000
72	0.0	0.0	0.0091	0.2091	0.8182	0.9909	1.0000	1.0000	1.0000
73	0.0	0.0	0.0	0.0932	0.8729	1.0000	1.0000	1.0000	1.0000
74	0.0	0.0	0.0100	0.1400	0.8600	1.0000	1.0000	1.0000	1.0000
75	0.0	0.0	0.0227	0.0909	0.8636	1.0000	1.0000	1.0000	1.0000
76	0.0	0.0	0.0	0.2069	0.9310	1.0000	1.0000	1.0000	1.0000
77	0.0	0.0	0.0	0.1053	0.8947	1.0000	1.0000	1.0000	1.0000
78	0.0	0.0	0.0	0.1429	0.8571	1.0000	1.0000	1.0000	1.0000
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3.5.2 The Statistical Filter

The following statistics are computed for each cycle generated:

1. Average Speed
2. Percent Idle
3. Percent Cruise (idles not included)
4. Percent Acceleration
5. Percent Deceleration
6. Kolmogorov-Smirnov Test on:
    a. Total Matrix
    b. Cruise Only
    c. Acceleration Only
    d. Deceleration Only
7. Cycle Duration
8. Cycle Distance
9. Stops per Mile.

The statistical filter is a computer program subroutine in which the cycle average speed and percent idle are first compared with the average speed and percent idle for the operational data. If these cycle statistics are within the range established around the input statistics, the cycle passes through that part of the filter to the next set of tests. If not, the generation of another cycle begins.

The average speed for the cycle is required to be in the range: input average speed ± M mph. The value of M is usually specified to be one or two, but if difficulty is experienced in getting cycles through the filter, M may be given a value as large as five. Similarly, the cycle percent idle is required to be in the range: percent idle ± N percent. The value of N is usually specified to be two, but may be as large as five if difficulty is experienced.

The Kolmogorov-Smirnov (K-S) test provides a means for determining the significance level at which a cycle can be said to be representative. The K-S one-sample test is concerned with the degree of agreement between the distribution function for a set of sample values (observed values) and a specified theoretical distribution. It determines whether the sample values can reasonably be considered to have come from a population having the theoretical distribution. The test consists of determining the absolute value of the maximum difference between the sample and theoretical distributions. The sampling distribution of that maximum difference has been used to create tables of critical differences as a function of sample size and desired significance level (Reference 4).

To compare a cycle matrix with the input matrix using the K-S test, the following procedure was used: A distribution function created from the input matrix was specified to be the theoretical (or population) distribution. A distribution function created from each cycle matrix played the role of the sample distribution. The distribution function for a matrix is generated by first dividing the frequency in each cell by the total matrix frequency. A running sum of these values is then obtained, cell by cell, by adding the normalized values from top to bottom (simply because the computer is more efficient that way) and then from left to right. The process is illustrated in Table 18. The distribution function is shown in a matrix format for convenience, but it is really a vector obtained by placing the columns end-to-end, working from left to right.

Distribution functions were obtained in this manner for the total initial-speed-versus-delta-speed matrix and for the submatrices consisting of cruises only (zero-delta-speed column), accelerations only (positive delta speeds), and decelerations only (negative delta speeds). Four K-S tests were thus utilized in the comparison of the input and cycle matrices.

Acceptance or rejection of the null hypothesis (i.e., that the matrices are not significantly different) with the K-S test is referenced to a criterion level depending only on the sample size and the selected significance level. The criterion difference for the K-S test is

$$D_c = \frac{Z}{\sqrt{n}}$$

where

D_c = the criterion difference
Z = a number depending on the selected significance level
n = sample size.

If the significance level is 0.05, then Z = 1.36. For a sample size of 100, the criterion difference would be

$$D_c = \frac{1.36}{\sqrt{100}} = 0.136.$$

Therefore, if the distribution function for a sample of size 100 were compared to a theoretical distribution function, and if the absolute value of the maximum difference between the distribution functions were less than 0.136, then one would conclude that the null hypothesis cannot be rejected at the 0.05 significance level.

If a large number of samples, each of size 100, were taken from the population of interest, one expects that 5 percent of them will have K-S differences greater than the criterion value of 0.05. That is, there is a probability of 0.05 of rejecting the null hypothesis, even though it is true.

A Type I error is committed when the null hypothesis is rejected when it is true. In the present application, a Type I error consists of rejecting a cycle which is representative. Occurrences of Type I errors are thus not serious in the search for representative cycles, resulting only in some inefficiency in the cycle-generation process. The Type II error. Here the acceptance of a cycle which is not representative, must be avoided, of course, wherever possible. Unfortunately, there is no feasible way of computing Type II error probabilities for the K-S test. However, if the Type I error probability is allowed to become larger, then the Type II error probability will become smaller. Therefore, the criterion K-S significance level (Type I error probability) is set at as large a value as possible commensurate with a reasonable probability of getting candidate cycles through the statistical filter.

Table 18. CREATION OF MATRIX DISTRIBUTION FUNCTION

A. Frequency Matrix

0	5	2	1	2	
2	7	5	3	3	
2	5	1	6	4	(N = 100)
1	13	12	3	1	
5	10	5	2	0	

B. Normalized Matrix

0	.05	.02	.01	.02
.02	.07	.05	.03	.03
.02	.05	.01	.06	.04
.01	.13	.12	.03	.01
.05	.10	.05	.02	0

C. Distribution Function

0	.15	.52	.76	.92
.02	.22	.57	.79	.95
.04	.27	.58	.85	.99
.05	.40	.70	.88	1.00
.10	.50	.75	.90	1.00

As a general rule of thumb, the Type I error probability is usually set equal to 0.05 (i.e., the 95 percent confidence level) for most testing purposes. For the purpose of generating representative cycles filtered by the K-S test, however, one would like to see significance levels set at 0.10 or 0.20, or even higher in order to reduce the Type II error probability. In the case of nonfreeway matrices, where the average speed is usually moderate, significant levels of 0.05 or larger can usually be obtained for a few cycles at least. In the case of freeway matrices, or nonfreeway matrices with high average speed, there will frequently be difficulty in generating cycles which will pass at even the 0.01 significance level. This is believed to result from the fact that the small sample size for the cycle precludes an adequate sampling of the input matrix. Nonfreeway matrices tend to show the frequency data clustering in the lowest half of the matrix, while the frequency data tend to be distributed over the complete freeway matrix. Additional research into this phenomenon is required, however, to establish a firm relationship between the matrix frequency distribution and the probability of generating representative cycles.

To summarize, the statistical filter tests on average speed, percent idle, and the four K-S differences between the input and cycle distribution functions defined above. A single computer run usually generates 10,000 to 15,000 cycles, outputting the starting random number and the statistics for each cycle which passes through the statistical filter.

After selection of the candidate cycles, as discussed below, the starting random number for each candidate cycle is input to another computer program which generates the cycle again and outputs a plot of the cycle and prints the corresponding driving schedule. It should be noted here that the random-number generation is really a psuedo-random-number generation. That is, for a given starting number, the rest of the numbers in the sequence are fixed. Thus, one need only know the starting random number to recreate any cycle.

At this point it must be noted that the tests built into the statistical filter define what is meant by the term "representative." For example, instead of performing the four K-S tests described above, K-S tests could be made by comparing the speed distribution functions for the input and cycle (obtained from the matrix row sums) and by comparing the input and cycle delta-speed distribution functions (obtained from the matrix column sums). Or, one can add those K-S tests to those already used in the filter.

Additional tests can easily be created as a function of which characteristics of the operational data one deems to be most significant in defining cycle representativeness. One could, of course, test for 20 characteristic statistics, say, to ensure representativeness. A caveat is in order here, however. As one builds more and more tests into the filter, the probability that a cycle can pass every test becomes smaller and smaller. As a result, larger and larger numbers of cycles must be generated in order to get a few cycles through the filter.

Efficient Monte Carlo cycle generation thus requires that the number of tests built into the statistical filter be kept to a relatively small number. It is, therefore, necessary to characterize carefully those attributes of operational data which one deems to reflect best what one means by representativeness in a cycle. Additional research is indicated here for the purpose of characterizing representativeness in terms of operational parameters and developing an optimized set of statistical filter tests.

3.5.3 Cycle-Generation Constraints

Some constraints may be imposed on the cycle-generation process, however. For example, it is usually desired to start and end a cycle with an idle. In that case, at some time prior to the end of the nominal cycle duration (1/2 to 1 minute) the computer is programmed to look for an idle occurrence. If an idle occurs, the process stops when the idle stops (i.e., when a nonzero speed is randomly selected). The maximum cycle duration is an input to the program, however, so that the cycle-generation process is also stopped when that maximum time is reached, even though the idle may have continued.

In the case of freeway matrices, the idle percentage can have a low value such as 2 percent. Since the idle percentage is used as one of the criterion values to test the representativeness of the cycle, and since the probability of staying at idle is usually very high (because that probability is based just on the total row frequency for an initial speed of zero), it is necessary to force an acceleration after a time corresponding to one-half of the idle percentage in units of seconds.

To illustrate, suppose the nominal cycle duration is to be 10 minutes or 600 seconds, and the idle percentage is 2.33 percent, then, to be representative, the cycle should contain about 14 seconds of idle time. The cycle-generation process is started by forcing 7 seconds of idle time. An acceleration is then forced for an input number of seconds or until the average speed for the category is reached, should that occur first. If an idle naturally occurs at the end of the process (i.e., in the minute or so before the maximum time has been readied) it would be restricted to 7 seconds of duration for this example. When a deceleration to idle must be forced, the idle would again be constrained to a 7-second duration.

In the case of freeway matrices, the average speeds for the St. Louis operating data tend to be high. If the cycle starts and ends with an idle, the probability of achieving that input average speed has proven to be small, particularly for short-duration cycles. Since the idle percentage is small for freeway operation, say 2 percent, one can eliminate idle time in the cycle and still be within the usual region set about the input idle percentage in the statistical filter. Then, to maximize the probability that the cycle average speed will be reasonably close to the input average speed, one may start each cycle at the input average speed and dispense with forcing a deceleration to idle near the end of the cycle.

Cycles were developed for the two freeway categories (All Trucks and Express Buses), by setting the initial cycle speed to the average speed for the category. The resulting cycles have no idles, but since the percent idle for those trucks and buses is 0.02 and 1.28, respectively, the idle is within the usual desired band of ±2 percent.

3.5.4 Candidate-Cycle Selection

The number of cycles generated for each of the five specified data categories is shown by computer run in Table 19, together with the input criteria

Table 19. CYCLE GENERATION INPUT SUMMARY

DATA CATEGORY	CYCLES LENGTH (MINUTES)	SPEED BAND (MPH)	IDLE BAND (%)	K-S CRITERION LEVEL	CYCLES TO BE GENERATED
All Trucks, Freeway	10	±5.0	*	0.01	15,000
	10	±5.0	*	0.01	15,000
	10	±5.0	*	0.01	15,000
	20	±5.0	*	0.01	15,000
	20	±5.0	*	0.01	15,000
All Trucks, Nonfreeway	10	±5.0	±5	0.01	10,000
Express Buses, Freeway	10	±5.0	*	0.01	15,000
	20	±5.0	*	0.01	15,000
Express Buses, Nonfreeway	10	±2.0	±2	0.05	15,000
	10	±5.0	±5	0.05	10,000
	10	±5.0	±5	0.01	10,000
Transit Buses, Nonfreeway	10	±2.5	±3	0.05	500
	10	±1.0	±2	0.05	3,000
Total					153,500

*Indicates cycle initial speed set equal to category average speed.

for the statistical filter. Table 20 shows the number of cycles passing through the filter for each run and the breakdown with respect to the K-S significance level at which each cycle passed.

The assignment of the significance level at which each cycle passes is very conservative. That is, suppose a cycle passed at the 0.20 significance level for the overall matrix, the cruise submatrix, and the acceleration submatrix, but passed at the 0.01 level for the deceleration submatrix; the cycle would then have been deemed to pass at the 0.01 level, or the lowest level in the set of four K-S tests.

When more than three cycles for a data category passed through the filter, a selection of three candidate cycles was required. The selection was made on the basis of the six tests built into the filter and the additional statistics for percent cruise, percent acceleration, and percent deceleration. Listed in decreasing order of importance, the selection criteria are:

1. K-S Tests
   a. Overall matrix
   b. Cruise submatrix
   c. Acceleration and deceleration submatrices
2. Average speed
3. Percent idle
4. Percent cruise, acceleration, and deceleration

As a general rule, cycles passing through the filter yield speeds and percent idles which are quite close to the desired values (±1 mph and ±2 percent, respectively). The correlation between K-S values and the corresponding percentages for cruise, acceleration, and deceleration is not, however, as good as might be expected. That is, the cycle can pass the K-S test for the acceleration submatrix at the 0.20 significance level (which is very good), and yet be as much as 4 percent different on the percent acceleration statistic. In general, it should be noted, cycles are selected as candidate cycles when each percentage statistic is in the range: input percentage ±2 percent.

The primary criteria for candidate cycle selection are the K-S tests. As indicated above, the K-S test for the overall matrix is considered to be the most important criterion. Because of the relatively large data frequency for cruises, the K-S test for cruises is the next most important criterion. To illustrate the candidate cycle selection process, suppose three of the following eight cycles with the indicated K-S significance levels must be selected:

	K-S OVERALL	K-S CRUISE	K-S ACCEL	K-S DECEL
Cycle 1	0.20	0.20	0.20	0.20
Cycle 2	0.20	0.10	0.05	0.15
Cycle 3	0.20	0.02	0.20	0.20
Cycle 4	0.20	0.15	0.02	0.10
Cycle 5	0.20	0.05	0.10	0.02
Cycle 6	0.20	0.05	0.05	0.05
Cycle 7	0.15	0.10	0.20	0.15
Cycle 8	0.05	0.10	0.20	0.20

Table 20. CYCLE GENERATION OUTPUT SUMMARY

DATA CATEGORY	CYCLES LENGTH (MINUTES)	NUMBER OF CYCLES GENERATED	CYCLES PASSED	CYCLES PASSED AT K-S SIGNIFICANCE LEVEL:				
				0.20	0.15	0.10	0.05	0.01
All Trucks, Freeway	10	15,000	1					1
	10	15,000	2				1	1
	10	15,000	3					3
	20	15,000	0					
	20	15,000	1					1
All Trucks, Nonfreeway	10	10,000	30		1	2	1	26
Express Buses, Freeway	10	15,000	16	1		1	1	14
	20	15,000	7			1	1	5
Express Buses Nonfreeway	10	15,000	0					
	10	10,000	0					
	10	10,000	4					4
Transit Buses, Nonfreeway	10	500	10	2	2	1	3	2
	10	3,000	23	9	2	4	8	
Totals		153,500	97	12	5	9	15	57

It is immediately clear that Cycles 1, 2, 6, 7, and 8 are candidates for selection since each is at the 0.05 level or higher. Cycle 1 is obviously the best cycle since it is the only one to pass at the 0.20 significance level. No cycle passes at the 0.15 level, but Cycle 7 passes at the 0.10 level and thus is selected as the second candidate, even though Cycle 6 is at the 0.20 level for the overall matrix. The last cycle is to be selected from Cycles 2, 6, and 8. Since Cycles 2 and 6 are both at the 0.20 level for the overall matrix, the remaining tests provide the basis for selection of one of those two. Cycle 2 will thus be the choice for the third candidate cycle because the cruise and deceleration K-S values are better than those for Cycle 6. In the case where two cycles have both passed at exactly the same K-S test levels, then a choice between them would be based on which cycle had average speed and percent idle, cruise, acceleration, and deceleration values closest to the corresponding data category values.

The total number of selected candidate cycles was 19: three 10-minute cycles for each of the 5 data categories, three 20-minute cycles for Express Buses, Freeway, and a single 20-minute cycle for All Trucks, Freeway. (After 30,000 20-minute cycles had been generated for the last category, with just a single cycle passing through the filter (at the 0.01 significance level), the Project Officer directed that any further cycle-generation effort be discontinued for that category.)

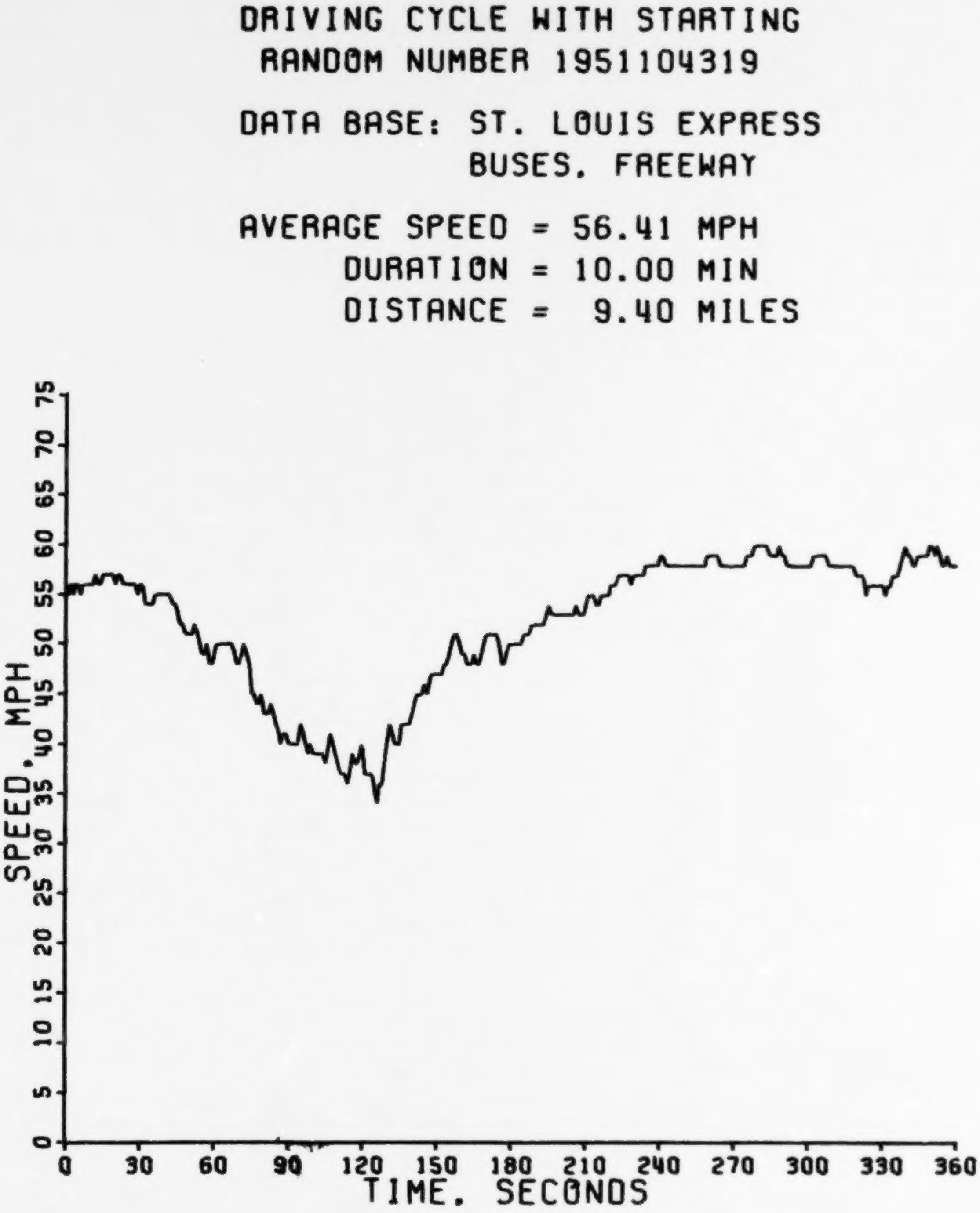
Figure 1 is a plot of the best 10-minute cycle generated for Express Buses, Freeway, and Table 21 gives the second-by-second driving schedule. The best 20-minute cycle for that category is shown as the Figure 2 plot and the Table 22 schedule. The best cycle for Express Buses, Nonfreeway, is plotted in Figure 3 and Table 23 gives the schedule. A plot and second-by-second driving schedule for the best cycle for each of the other data categories are given in Appendix C.

3.6 COMPARISON OF SUMMARY STATISTICS

As described above, the initial-speed-versus-delta-speed matrices developed from the St. Louis data allowed for initial speeds ranging from zero mph to 80 mph and for delta speeds ranging from -10 to +10 mph per second. The CAPE-21 matrices used to generate cycles were limited, because of chassis dynamometer constraints, to an initial-speed range of zero mph to 60 mph and a delta-speed range of -4 to +4 mph per 0.864 second. (The CAPE-21 delta-speed unit reflects the fact that the CAPE-21 data were collected at the rate of one record every 0.864 seconds.) Since speeds greater than 60 mph were set equal to 60 mph and delta speeds less than -4 mph per 0864 second or greater than +4 mph per 0864 second were set equal to -4 mph per 0864 second or +4 mph per 0864 second, respectively, for CAPE-21 purposes, it was necessary to do the same for the St. Louis matrices to provide for a compatible comparison.

In addition, since the St. Louis matrices used to generate cycles consisted of both urban and nonurban data, and since the CAPE-21 data consist of urban data only, it was necessary to generate St. Louis statistics for the urban data only. The St. Louis statistics were, therefore, recomputed from urban matrices generated in the CAPE-21 format. Finally, the average acceleration and deceleration rates for the CAPA-21 data were divided by 0.864 to yield those rates in units of mph per second for compatibility with the St. Louis rates.

Figure 1.



DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1951104319

DATA BASE: ST. LOUIS EXPRESS
BUSES, FREEWAY

AVERAGE SPEED = 56.41 MPH
DURATION = 10.00 MIN
DISTANCE = 9.40 MILES

Figure 1. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1951104319

DATA BASE: ST. LOUIS EXPRESS
BUSES, FREEWAY

AVERAGE SPEED = 56.41 MPH
DURATION = 10.00 MIN
DISTANCE = 9.40 MILES

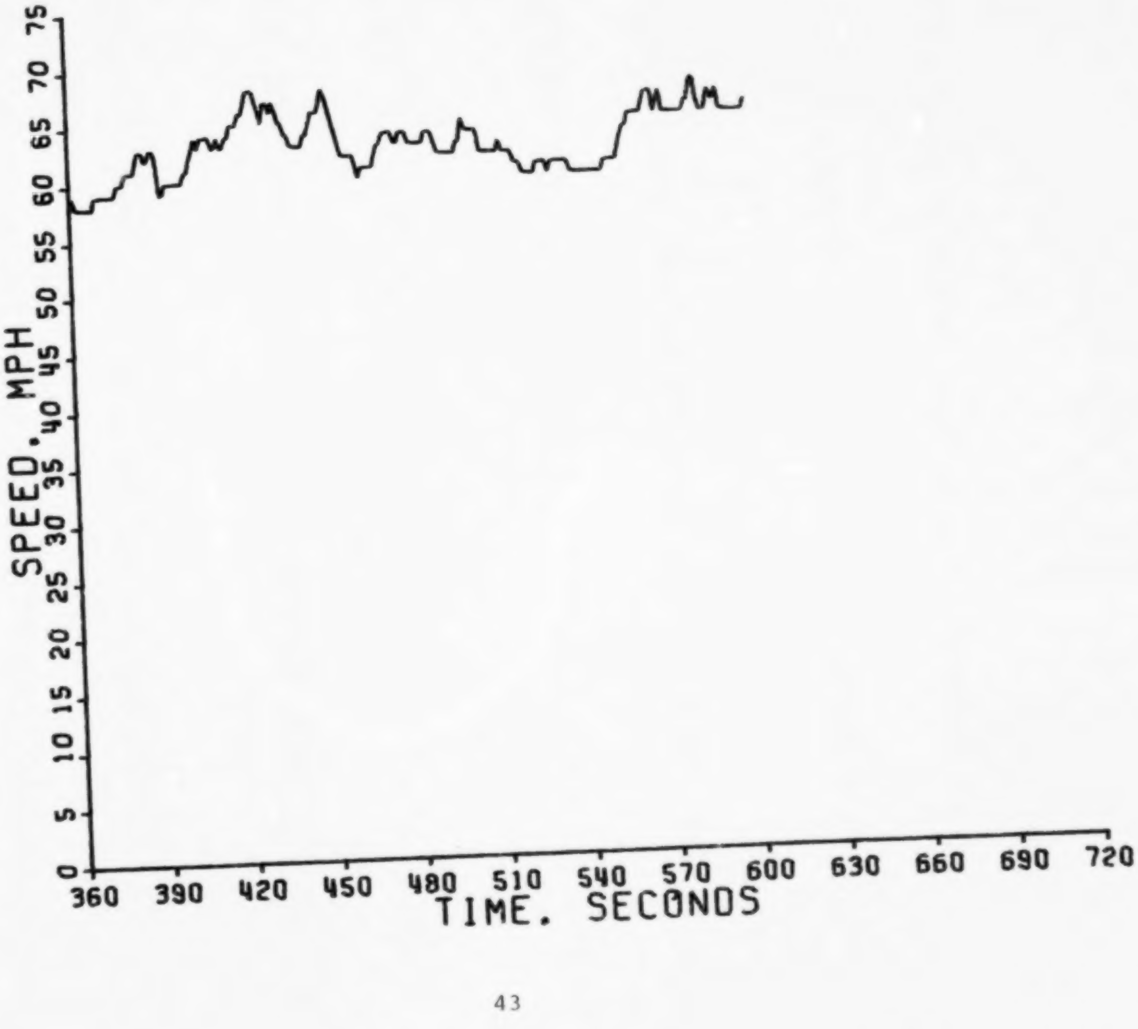


Table 21. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1951104319

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 1 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
0	55						
1	55	51	51	101	39	151	47
2	56	52	52	102	39	152	47
3	55	53	51	103	39	153	48
4	56	54	50	104	39	154	48
5	56	55	49	105	38	155	49
6	55	56	49	106	39	156	50
7	56	57	50	107	41	157	51
8	56	58	48	108	40	158	51
9	56	59	48	109	39	159	50
10	56	60	49	110	38	160	49
11	56	61	50	111	37	161	49
12	57	62	50	112	37	162	48
13	56	63	50	113	37	163	48
14	56	64	50	114	36	164	48
15	57	65	50	115	37	165	49
16	57	66	50	116	39	166	48
17	57	67	50	117	38	167	48
18	57	68	49	118	38	168	49
19	57	69	48	119	39	169	50
20	56	70	48	120	40	170	51
21	57	71	49	121	37	171	51
22	57	72	50	122	37	172	51
23	56	73	49	123	37	173	51
24	56	74	48	124	37	174	51
25	56	75	45	125	35	175	50
26	56	76	45	126	34	176	48
27	56	77	44	127	36	177	48
28	56	78	44	128	36	178	49
29	55	79	45	129	38	179	50
30	56	80	43	130	40	180	50
31	56	81	43	131	42	181	50
32	54	82	43	132	41	182	50
33	54	83	44	133	40	183	50
34	54	84	43	134	40	184	50
35	54	85	42	135	40	185	51
36	55	86	41	136	42	186	51
37	55	87	40	137	42	187	51
38	55	88	41	138	42	188	52
39	55	89	41	139	42	189	52
40	55	90	40	140	43	190	52
41	55	91	40	141	44	191	52
42	55	92	40	142	45	192	52
43	54	93	40	143	45	193	52
44	54	94	40	144	45	194	53
45	53	95	42	145	46	195	54
46	52	96	41	146	45	196	53
47	52	97	40	147	46	197	53
48	51	98	39	148	47	198	53
49	51	99	40	149	47	199	53
50	51	100	39	150	47	200	53

Table 21. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1951104319 (CONTINUED)

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 2 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
201	53	251	58	301	58	351	59
202	53	252	58	302	59	352	60
203	53	253	58	303	59	353	59
204	53	254	58	304	59	354	58
205	53	255	58	305	59	355	58
206	54	256	58	306	59	356	59
207	53	257	58	307	59	357	58
208	53	258	58	308	58	358	58
209	53	259	59	309	58	359	58
210	54	260	59	310	58	360	58
211	55	261	59	311	58	361	59
212	55	262	59	312	58	362	58
213	55	263	59	313	58	363	58
214	54	264	58	314	58	364	58
215	54	265	58	315	58	365	58
216	55	266	58	316	58	366	58
217	55	267	58	317	58	367	58
218	55	268	58	318	58	368	58
219	55	269	58	319	57	369	59
220	56	270	58	320	57	370	59
221	56	271	58	321	57	371	59
222	56	272	58	322	57	372	59
223	57	273	58	323	55	373	59
224	57	274	58	324	56	374	59
225	57	275	59	325	56	375	59
226	57	276	59	326	56	376	59
227	57	277	59	327	56	377	60
228	56	278	60	328	56	378	60
229	57	279	60	329	56	379	60
230	57	280	60	330	56	380	61
231	57	281	60	331	55	381	61
232	57	282	60	332	56	382	61
233	57	283	60	333	56	383	61
234	58	284	59	334	57	384	62
235	58	285	59	335	57	385	63
236	58	286	59	336	57	386	63
237	58	287	59	337	58	387	62
238	58	288	60	338	59	388	62
239	58	289	59	339	60	389	63
240	59	290	59	340	59	390	63
241	59	291	58	341	59	391	62
242	58	292	58	342	58	392	59
243	58	293	58	343	58	393	59
244	58	294	58	344	59	394	60
245	58	295	58	345	59	395	60
246	58	296	58	346	59	396	60
247	58	297	58	347	59	397	60
248	58	298	58	348	59	398	60
249	58	299	58	349	60	399	60
250	58	300	58	350	60	400	60

Table 21. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1951104319 (CONTINUED)

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 3 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
401	61	451	68	501	64	551	61
402	61	452	67	502	64	552	61
403	62	453	66	503	64	553	61
404	63	454	65	504	64	554	61
405	64	455	64	505	64	555	62
406	63	456	63	506	62	556	63
407	64	457	62	507	62	557	64
408	64	458	62	508	62	558	64
409	64	459	62	509	62	559	65
410	64	460	62	510	62	560	65
411	63	461	62	511	62	561	65
412	63	462	61	512	62	562	65
413	64	463	60	513	63	563	65
414	63	464	61	514	62	564	66
415	63	465	61	515	62	565	67
416	64	466	61	516	62	566	67
417	64	467	61	517	62	567	67
418	65	468	61	518	61	568	65
419	65	469	62	519	61	569	66
420	65	470	63	520	61	570	67
421	66	471	63	521	60	571	65
422	66	472	64	522	60	572	65
423	67	473	64	523	60	573	65
424	68	474	64	524	60	574	65
425	68	475	64	525	60	575	65
426	68	476	63	526	61	576	65
427	67	477	63	527	61	577	65
428	66	478	64	528	61	578	65
429	65	479	64	529	61	579	66
430	67	480	64	530	60	580	66
431	67	481	63	531	61	581	68
432	66	482	63	532	61	582	68
433	67	483	63	533	61	583	66
434	66	484	63	534	61	584	65
435	65	485	63	535	61	585	65
436	65	486	63	536	61	586	65
437	64	487	64	537	61	587	67
438	64	488	64	538	60	588	66
439	63	489	64	539	60	589	66
440	63	490	63	540	60	590	67
441	63	491	62	541	60	591	65
442	63	492	62	542	60	592	65
443	63	493	62	543	60	593	65
444	64	494	62	544	60	594	65
445	64	495	62	545	60	595	65
446	65	496	62	546	60	596	65
447	66	497	62	547	60	597	65
448	66	498	63	548	60	598	65
449	66	499	63	549	60	599	65
450	67	500	65	550	61	600	66

Figure 2.

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1341116295

DATA BASE: ST. LOUIS EXPRESS
BUSES, FREEWAY

AVERAGE SPEED = 55.61 MPH
DURATION = 20.00 MIN
DISTANCE = 18.54 MILES

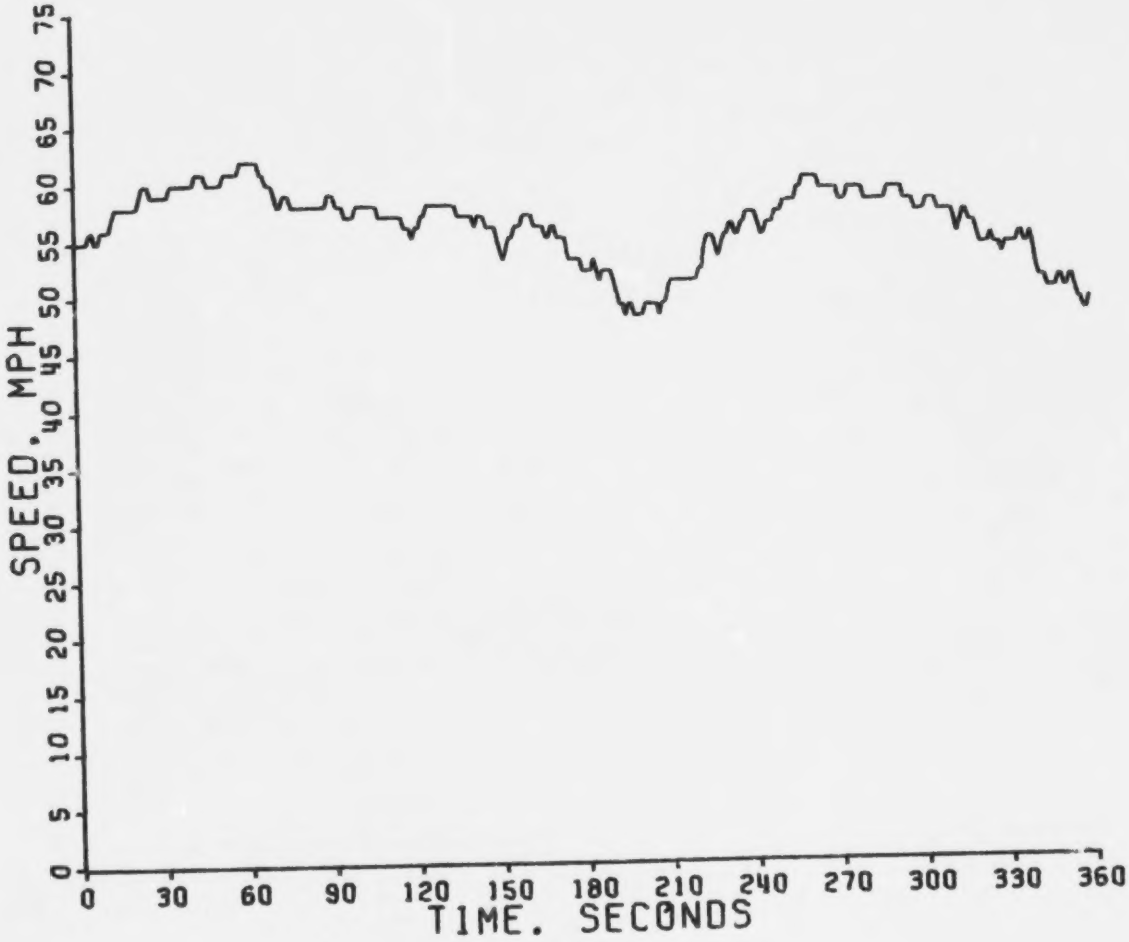


Figure 2. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1341116295

DATA BASE: ST. LOUIS EXPRESS
BUSES, FREEWAY

AVERAGE SPEED = 55.61 MPH
DURATION = 20.00 MIN
DISTANCE = 18.54 MILES

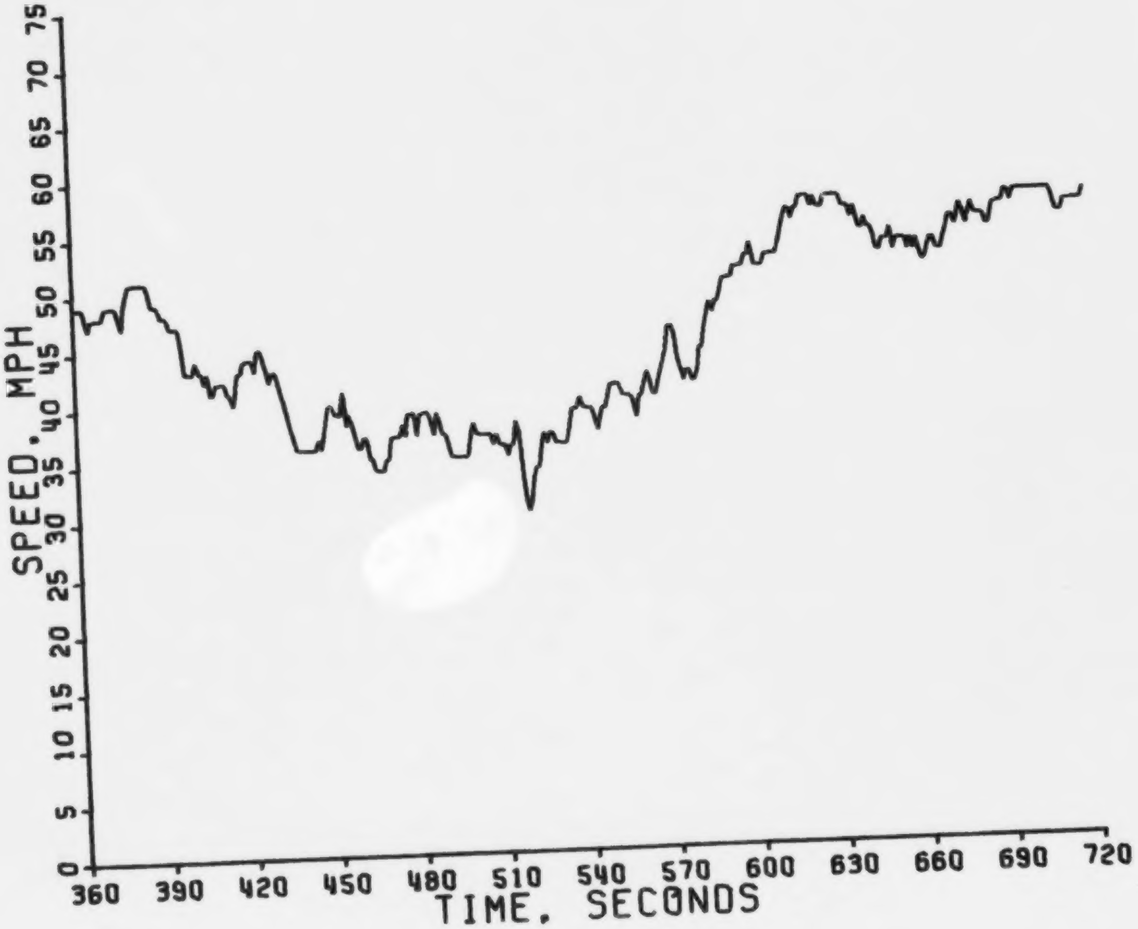


Figure 2. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1341116295

DATA BASE: ST. LOUIS EXPRESS
BUSES, FREEWAY

AVERAGE SPEED = 55.61 MPH
DURATION = 20.00 MIN
DISTANCE = 18.54 MILES

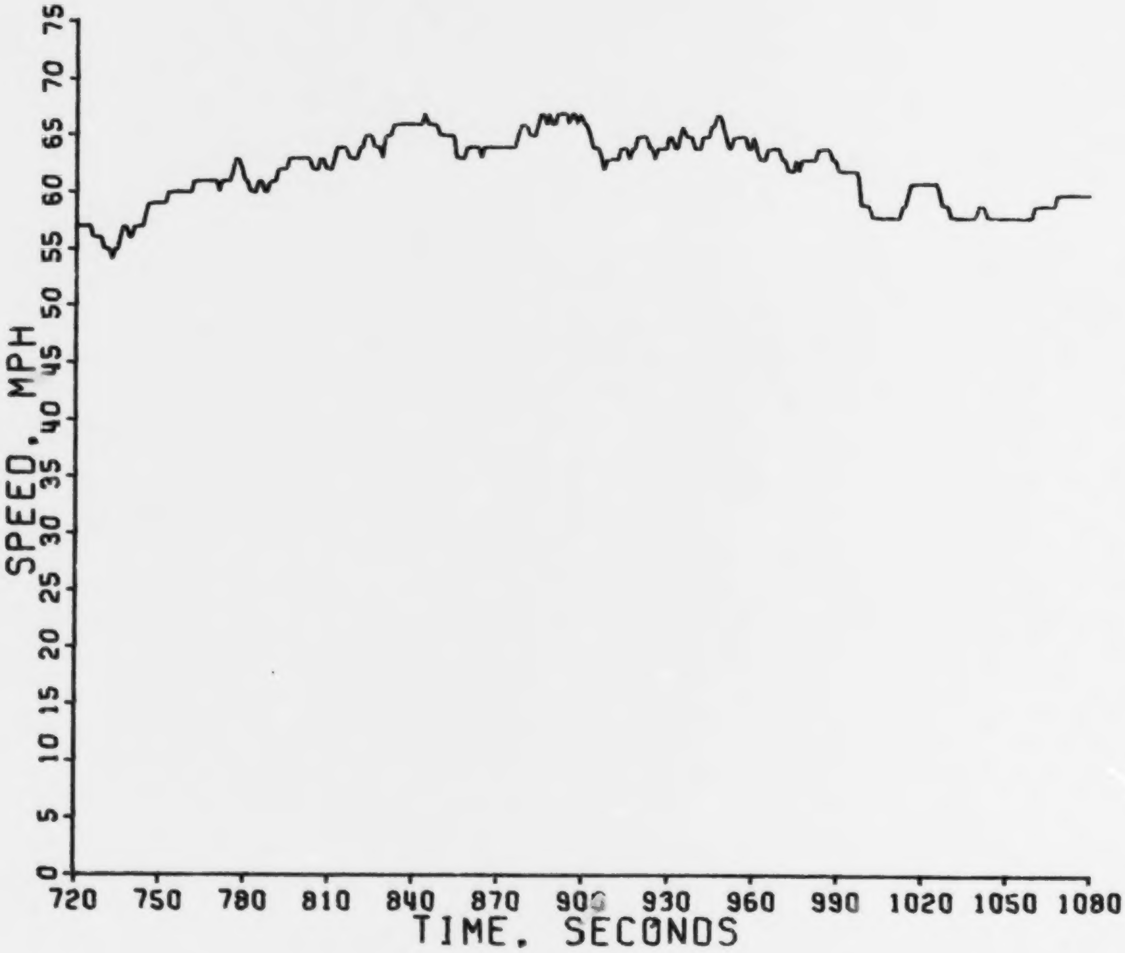


Figure 2. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1341116295

DATA BASE: ST. LOUIS EXPRESS
BUSES. FREEWAY

AVERAGE SPEED = 55.61 MPH
DURATION = 20.00 MIN
DISTANCE = 18.54 MILES

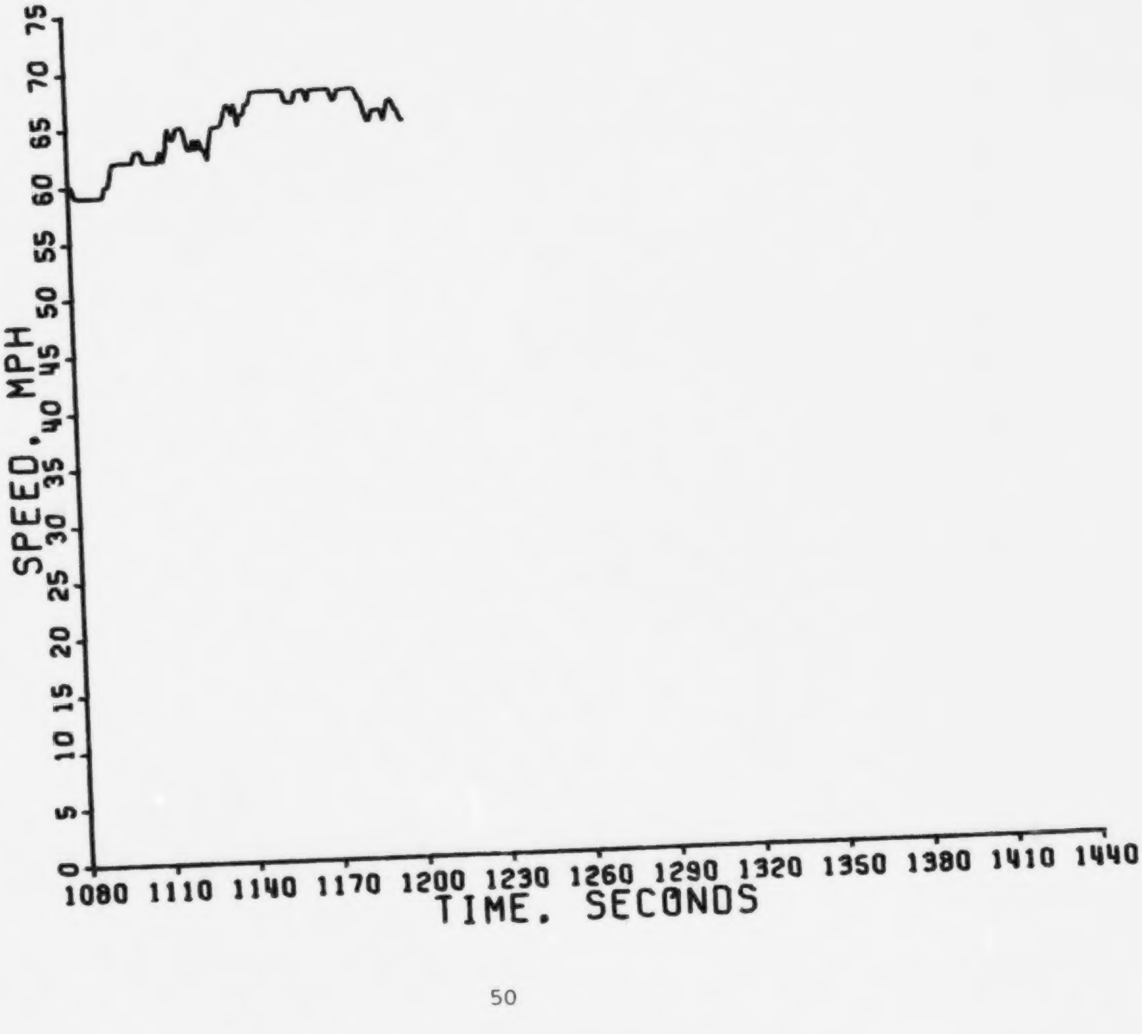


Table 22. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1341116295

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 1 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
0	55						
1	55	51	60	101	58	151	54
2	55	52	60	102	58	152	53
3	55	53	61	103	58	153	54
4	55	54	61	104	58	154	55
5	56	55	61	105	58	155	55
6	56	56	61	106	58	156	56
7	55	57	61	107	58	157	56
8	55	58	61	108	57	158	56
9	56	59	62	109	57	159	57
10	56	60	62	110	57	160	57
11	56	61	62	111	57	161	57
12	56	62	62	112	57	162	57
13	57	63	62	113	57	163	56
14	58	64	62	114	57	164	56
15	58	65	62	115	57	165	56
16	58	66	61	116	57	166	56
17	58	67	61	117	56	167	55
18	58	68	60	118	56	168	55
19	58	69	60	119	56	169	56
20	58	70	60	120	55	170	56
21	58	71	59	121	56	171	55
22	58	72	58	122	56	172	55
23	59	73	58	123	57	173	55
24	60	74	59	124	57	174	55
25	60	75	59	125	58	175	53
26	60	76	59	126	58	176	53
27	59	77	58	127	58	177	53
28	59	78	58	128	58	178	53
29	59	79	58	129	58	179	53
30	59	80	58	130	58	180	52
31	59	81	58	131	58	181	52
32	59	82	58	132	58	182	52
33	59	83	58	133	58	183	52
34	60	84	58	134	58	184	53
35	60	85	58	135	58	185	52
36	60	86	58	136	57	186	51
37	60	87	58	137	57	187	52
38	60	88	58	138	57	188	52
39	60	89	58	139	57	189	52
40	60	90	59	140	57	190	52
41	60	91	59	141	57	191	51
42	60	92	59	142	56	192	50
43	61	93	58	143	57	193	49
44	61	94	58	144	57	194	49
45	61	95	58	145	57	195	48
46	61	96	57	146	56	196	49
47	60	97	57	147	56	197	49
48	60	98	57	148	56	198	48
49	60	99	57	149	56	199	48
50	60	100	58	150	55	200	48

Table 22. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1341116295 (CCNTINUED)

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 2 OF 6

SECCND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
201	48	251	58	301	57	351	50
202	49	252	58	302	58	352	50
203	49	253	58	303	58	353	51
204	49	254	58	304	58	354	51
205	49	255	58	305	58	355	50
206	49	256	59	306	57	356	49
207	48	257	59	307	57	357	49
208	49	258	60	308	57	358	48
209	49	259	60	309	57	359	48
210	50	260	60	310	57	360	49
211	51	261	60	311	57	361	49
212	51	262	60	312	56	362	49
213	51	263	60	313	55	363	49
214	51	264	59	314	56	364	48
215	51	265	59	315	57	365	47
216	51	266	59	316	57	366	48
217	51	267	59	317	56	367	48
218	51	268	59	318	56	368	48
219	51	269	59	319	56	369	48
220	51	270	59	320	55	370	48
221	52	271	58	321	54	371	49
222	52	272	58	322	54	372	49
223	54	273	58	323	54	373	49
224	55	274	59	324	54	374	49
225	55	275	59	325	55	375	49
226	55	276	59	326	54	376	48
227	54	277	59	327	54	377	47
228	53	278	59	328	54	378	49
229	54	279	59	329	53	379	50
230	55	280	58	330	54	380	51
231	55	281	58	331	54	381	51
232	56	282	58	332	54	382	51
233	56	283	58	333	54	383	51
234	55	284	58	334	54	384	51
235	55	285	58	335	55	385	51
236	56	286	58	336	55	386	51
237	56	287	58	337	54	387	50
238	57	288	59	338	54	388	49
239	57	289	59	339	55	389	49
240	57	290	59	340	54	390	49
241	57	291	59	341	52	391	48
242	56	292	59	342	51	392	48
243	55	293	59	343	51	393	48
244	55	294	58	344	51	394	47
245	56	295	58	345	50	395	47
246	56	296	58	346	50	396	47
247	56	297	58	347	50	397	47
248	57	298	57	348	50	398	45
249	57	299	57	349	51	399	43
250	57	300	57	350	51	400	43

Table 22. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1341116295 (CONTINUED)

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 3 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
401	43	451	40	501	38	551	41
402	43	452	39	502	37	552	41
403	44	453	39	503	37	553	41
404	43	454	39	504	37	554	40
405	43	455	41	505	37	555	40
406	42	456	38	506	37	556	40
407	43	457	39	507	37	557	40
408	41	458	38	508	36	558	39
409	41	459	37	509	37	559	38
410	42	460	36	510	36	560	40
411	42	461	36	511	36	561	40
412	42	462	37	512	36	562	41
413	42	463	37	513	35	563	42
414	41	464	35	514	36	564	41
415	41	465	35	515	36	565	40
416	40	466	34	516	38	566	40
417	41	467	34	517	37	567	41
418	43	468	34	518	33	568	42
419	43	469	34	519	31	569	43
420	44	470	35	520	30	570	44
421	44	471	35	521	31	571	46
422	44	472	37	522	33	572	46
423	44	473	37	523	34	573	45
424	43	474	37	524	34	574	43
425	45	475	37	525	36	575	42
426	45	476	38	526	37	576	41
427	44	477	37	527	36	577	42
428	43	478	39	528	37	578	42
429	42	479	39	529	37	579	41
430	43	480	39	530	36	580	41
431	43	481	37	531	36	581	42
432	42	482	39	532	36	582	44
433	41	483	39	533	36	583	44
434	40	484	39	534	36	584	46
435	39	485	39	535	37	585	47
436	38	486	38	536	39	586	48
437	37	487	37	537	39	587	47
438	36	488	39	538	39	588	48
439	36	489	38	539	40	589	48
440	36	490	37	540	39	590	49
441	36	491	37	541	39	591	50
442	36	492	36	542	39	592	50
443	36	493	35	543	39	593	50
444	36	494	35	544	38	594	50
445	36	495	35	545	37	595	51
446	37	496	35	546	38	596	51
447	36	497	35	547	39	597	51
448	37	498	35	548	39	598	51
449	39	499	35	549	40	599	52
450	40	500	37	550	41	600	52

Table 22. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1341116295 (CONTINUED)

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 4 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
601	53	651	54	701	57	751	59
602	51	652	52	702	57	752	59
603	51	653	53	703	57	753	60
604	51	654	53	704	57	754	60
605	51	655	53	705	57	755	60
606	52	656	53	706	57	756	60
607	52	657	52	707	57	757	60
608	52	658	53	708	57	758	60
609	52	659	52	709	56	759	60
610	52	660	53	710	55	760	60
611	53	661	52	711	55	761	60
612	54	662	51	712	55	762	61
613	55	663	51	713	56	763	61
614	56	664	52	714	56	764	61
615	56	665	53	715	56	765	61
616	55	666	53	716	56	766	61
617	56	667	52	717	56	767	61
618	56	668	52	718	56	768	61
619	57	669	52	719	56	769	61
620	57	670	53	720	57	770	61
621	57	671	54	721	57	771	60
622	57	672	55	722	57	772	61
623	56	673	55	723	57	773	61
624	57	674	54	724	57	774	61
625	56	675	55	725	57	775	61
626	56	676	56	726	56	776	62
627	56	677	55	727	56	777	63
628	57	678	54	728	56	778	63
629	57	679	55	729	56	779	62
630	57	680	56	730	55	780	61
631	57	681	55	731	55	781	61
632	57	682	55	732	55	782	60
633	57	683	55	733	54	783	60
634	56	684	55	734	55	784	60
635	56	685	54	735	55	785	61
636	56	686	54	736	56	786	61
637	55	687	55	737	57	787	60
638	56	688	56	738	57	788	60
639	55	689	56	739	56	789	61
640	54	690	56	740	56	790	61
641	54	691	56	741	57	791	61
642	55	692	57	742	57	792	62
643	54	693	57	743	57	793	62
644	54	694	56	744	57	794	62
645	53	695	57	745	58	795	62
646	52	696	57	746	59	796	63
647	52	697	57	747	59	797	63
648	53	698	57	748	59	798	63
649	53	699	57	749	59	799	63
650	53	700	57	750	59	800	63

Table 22. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1341116295 (CONTINUED)

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 5 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
801	63	851	65	901	66	951	64
802	63	852	65	902	65	952	64
803	63	853	65	903	64	953	65
804	62	854	65	904	64	954	65
805	62	855	63	905	64	955	65
806	62	856	63	906	63	956	65
807	63	857	63	907	62	957	65
808	63	858	63	908	63	958	64
809	62	859	64	909	63	959	64
810	62	860	64	910	63	960	65
811	62	861	64	911	63	961	64
812	63	862	64	912	63	962	63
813	64	863	64	913	64	963	63
814	64	864	63	914	64	964	63
815	64	865	64	915	64	965	64
816	64	866	64	916	63	966	64
817	63	867	64	917	64	967	64
818	63	868	64	918	64	968	64
819	63	869	64	919	65	969	64
820	63	870	64	920	65	970	63
821	64	871	64	921	65	971	63
822	64	872	64	922	65	972	62
823	65	873	64	923	64	973	62
824	65	874	64	924	64	974	62
825	65	875	64	925	63	975	63
826	64	876	64	926	64	976	62
827	64	877	65	927	64	977	63
828	64	878	66	928	64	978	63
829	63	879	66	929	64	979	63
830	65	880	66	930	65	980	63
831	65	881	65	931	65	981	63
832	65	882	65	932	64	982	63
833	66	883	65	933	64	983	64
834	66	884	66	934	65	984	64
835	66	885	67	935	66	985	64
836	66	886	67	936	65	986	64
837	66	887	66	937	65	987	64
838	66	888	67	938	65	988	63
839	66	889	66	939	64	989	63
840	66	890	66	940	64	990	62
841	66	891	67	941	64	991	62
842	66	892	67	942	65	992	62
843	66	893	67	943	65	993	62
844	67	894	67	944	65	994	62
845	66	895	66	945	66	995	62
846	66	896	67	946	66	996	62
847	66	897	67	947	67	997	62
848	66	898	66	948	67	998	59
849	65	899	67	949	66	999	59
850	65	900	66	950	65	1000	59

Table 22. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1341116295 (CONTINUED)

ST. LOUIS EXPRESS BUSES, FREEWAY

PAGE 6 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
1001	59	1051	58	1101	62	1151	68
1002	58	1052	58	1102	62	1152	68
1003	58	1053	58	1103	62	1153	68
1004	58	1054	58	1104	63	1154	68
1005	58	1055	58	1105	63	1155	68
1006	58	1056	58	1106	63	1156	68
1007	58	1057	58	1107	62	1157	68
1008	58	1058	58	1108	62	1158	67
1009	58	1059	58	1109	62	1159	67
1010	58	1060	59	1110	62	1160	67
1011	58	1061	59	1111	62	1161	67
1012	58	1062	59	1112	62	1162	68
1013	59	1063	59	1113	63	1163	68
1014	59	1064	59	1114	62	1164	68
1015	60	1065	59	1115	63	1165	68
1016	61	1066	59	1116	65	1166	67
1017	61	1067	59	1117	64	1167	68
1018	61	1068	60	1118	64	1168	68
1019	61	1069	60	1119	65	1169	68
1020	61	1070	60	1120	65	1170	68
1021	61	1071	60	1121	65	1171	68
1022	61	1072	60	1122	64	1172	68
1023	61	1073	60	1123	63	1173	68
1024	61	1074	60	1124	63	1174	68
1025	61	1075	60	1125	64	1175	67
1026	60	1076	60	1126	63	1176	67
1027	59	1077	60	1127	64	1177	68
1028	59	1078	60	1128	63	1178	68
1029	59	1079	60	1129	63	1179	68
1030	58	1080	60	1130	62	1180	68
1031	58	1081	60	1131	64	1181	68
1032	58	1082	59	1132	65	1182	68
1033	58	1083	59	1133	65	1183	68
1034	58	1084	59	1134	65	1184	67
1035	58	1085	59	1135	65	1185	67
1036	58	1086	59	1136	66	1186	66
1037	58	1087	59	1137	67	1187	65
1038	58	1088	59	1138	67	1188	65
1039	58	1089	59	1139	66	1189	66
1040	59	1090	59	1140	67	1190	66
1041	59	1091	59	1141	65	1191	66
1042	59	1092	59	1142	66	1192	66
1043	58	1093	60	1143	66	1193	65
1044	58	1094	60	1144	67	1194	66
1045	58	1095	61	1145	67	1195	67
1046	58	1096	62	1146	68	1196	67
1047	58	1097	62	1147	68	1197	66
1048	58	1098	62	1148	68	1198	66
1049	58	1099	62	1149	68	1199	65
1050	58	1100	62	1150	68	1200	65

Figure 3.

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1947538839

DATA BASE: ST. LOUIS EXPRESS
BUSES. NONFREEWAY

AVERAGE SPEED = 37.67 MPH
DURATION = 10.00 MIN
DISTANCE = 6.28 MILES

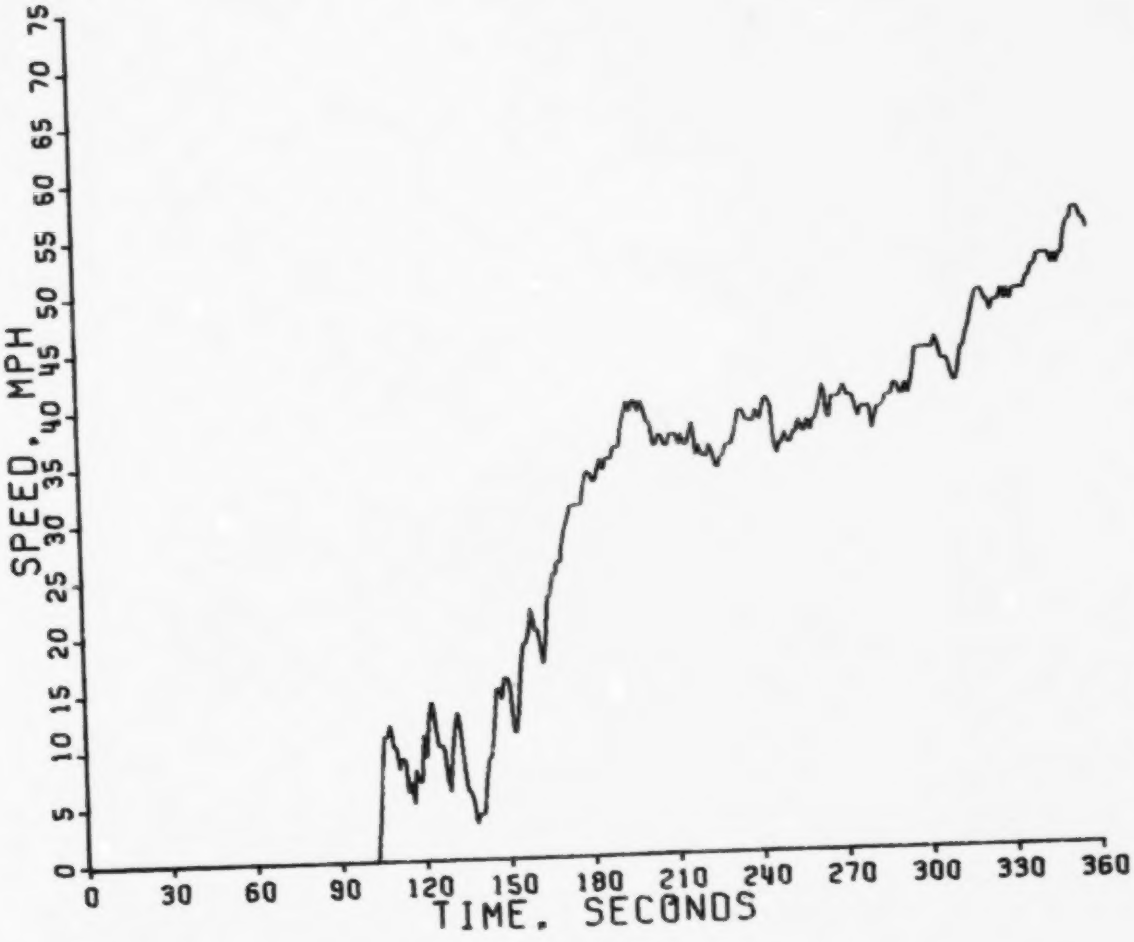


Figure 3. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1947538839

DATA BASE: ST. LOUIS EXPRESS
BUSES, NONFREEWAY

AVERAGE SPEED = 37.67 MPH
DURATION = 10.00 MIN
DISTANCE = 6.28 MILES

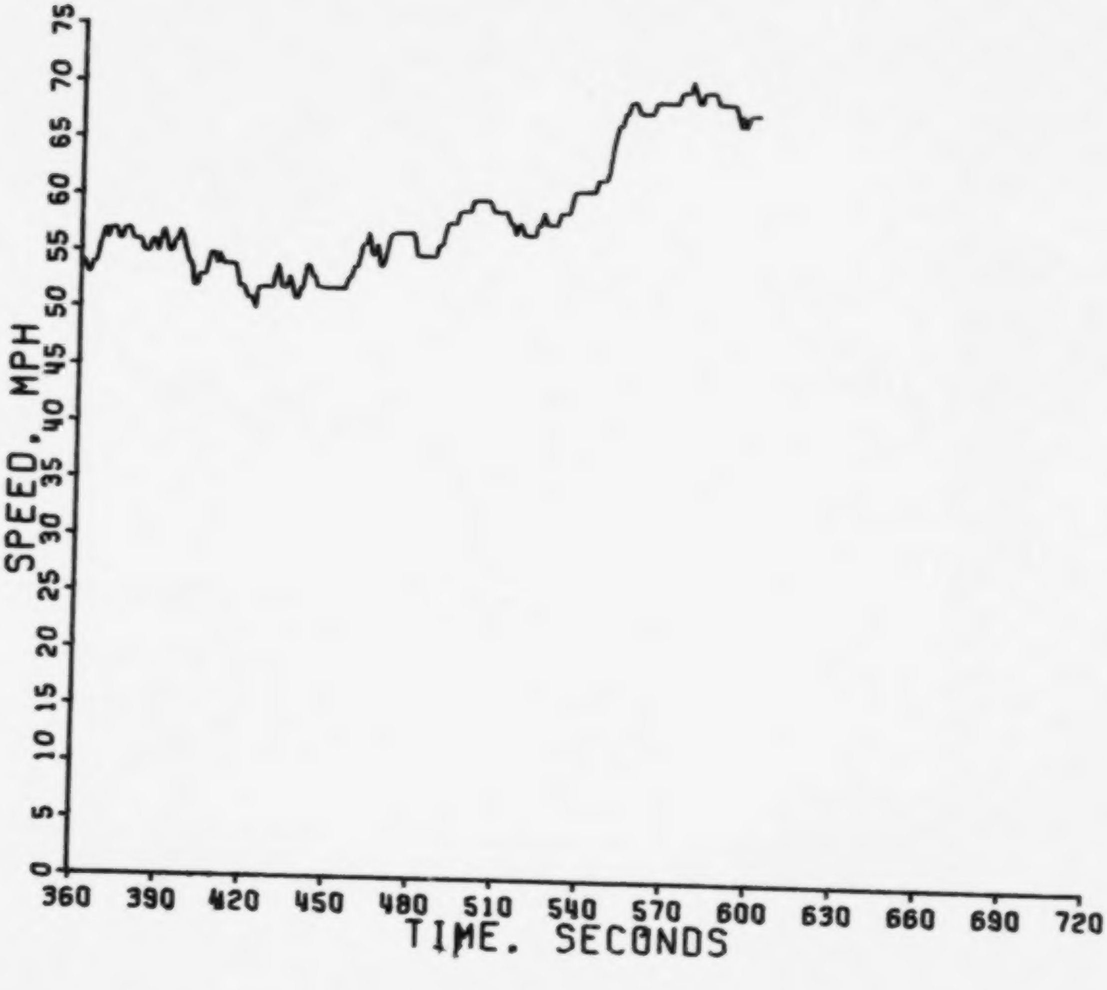


Table 23. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1947538839

ST. LOUIS EXPRESS BUSES, NONFREEWAY

PAGE 1 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
0	0						
1	0	51	0	101	0	151	15
2	0	52	0	102	0	152	11
3	0	53	0	103	0	153	11
4	0	54	0	104	4	154	13
5	0	55	0	105	8	155	17
6	0	56	0	106	11	156	19
7	0	57	0	107	11	157	19
8	0	58	0	108	12	158	20
9	0	59	0	109	10	159	22
10	0	60	0	110	10	160	20
11	0	61	0	111	8	161	20
12	0	62	0	112	9	162	19
13	0	63	0	113	9	163	17
14	0	64	0	114	6	164	19
15	0	65	0	115	7	165	23
16	0	66	0	116	5	166	23
17	0	67	0	117	8	167	25
18	0	68	0	118	7	168	25
19	0	69	0	119	7	169	26
20	0	70	0	120	11	170	26
21	0	71	0	121	9	171	28
22	0	72	0	122	13	172	29
23	0	73	0	123	14	173	30
24	0	74	0	124	12	174	31
25	0	75	0	125	10	175	31
26	0	76	0	126	10	176	31
27	0	77	0	127	10	177	31
28	0	78	0	128	7	178	31
29	0	79	0	129	6	179	33
30	0	80	0	130	9	180	34
31	0	81	0	131	12	181	34
32	0	82	0	132	13	182	33
33	0	83	0	133	11	183	33
34	0	84	0	134	8	184	34
35	0	85	0	135	6	185	35
36	0	86	0	136	6	186	34
37	0	87	0	137	5	187	35
38	0	88	0	138	3	188	35
39	0	89	0	139	4	189	35
40	0	90	0	140	4	190	36
41	0	91	0	141	4	191	36
42	0	92	0	142	7	192	36
43	0	93	0	143	9	193	38
44	0	94	0	144	9	194	39
45	0	95	0	145	11	195	40
46	0	96	0	146	15	196	39
47	0	97	0	147	15	197	40
48	0	98	0	148	14	198	40
49	0	99	0	149	16	199	39
50	0	100	0	150	16	200	40

Table 23. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1947538839 (CONTINUED)

ST. LOUIS EXPRESS BUSES, NONFREEWAY

PAGE 2 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
201	39	251	37	301	44	351	52
202	38	252	36	302	44	352	54
203	38	253	36	303	44	353	55
204	36	254	37	304	44	354	55
205	36	255	37	305	45	355	56
206	37	256	38	306	44	356	56
207	37	257	37	307	43	357	56
208	36	258	37	308	43	358	55
209	36	259	38	309	43	359	55
210	37	260	37	310	42	360	54
211	37	261	38	311	41	361	54
212	37	262	38	312	41	362	53
213	36	263	39	313	42	363	53
214	37	264	40	314	44	364	54
215	36	265	41	315	44	365	54
216	36	266	38	316	45	366	55
217	37	267	38	317	46	367	56
218	38	268	40	318	47	368	57
219	35	269	40	319	48	369	56
220	36	270	40	320	49	370	57
221	35	271	40	321	49	371	57
222	35	272	41	322	49	372	57
223	35	273	40	323	48	373	56
224	36	274	40	324	48	374	56
225	35	275	40	325	47	375	57
226	34	276	39	326	48	376	57
227	34	277	38	327	48	377	57
228	35	278	39	328	48	378	56
229	35	279	39	329	49	379	56
230	36	280	39	330	48	380	56
231	36	281	39	331	49	381	56
232	36	282	37	332	48	382	55
233	37	283	38	333	49	383	55
234	38	284	39	334	49	384	55
235	39	285	39	335	49	385	56
236	39	286	39	336	49	386	56
237	38	287	40	337	49	387	55
238	38	288	40	338	50	388	56
239	38	289	40	339	50	389	57
240	38	290	41	340	51	390	56
241	39	291	41	341	51	391	55
242	38	292	40	342	52	392	55
243	39	293	40	343	52	393	56
244	40	294	41	344	52	394	56
245	40	295	40	345	52	395	57
246	39	296	41	346	52	396	56
247	36	297	42	347	51	397	55
248	35	298	44	348	52	398	54
249	36	299	44	349	51	399	54
250	36	300	44	350	52	400	52

Table 23. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1947538839 (CONTINUED)

ST. LOUIS EXPRESS BUSES, NONFREEWAY

PAGE 3 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
401	52	451	52	501	60	551	67
402	53	452	52	502	60	552	68
403	53	453	52	503	60	553	68
404	53	454	52	504	60	554	69
405	54	455	53	505	60	555	69
406	55	456	53	506	59	556	69
407	55	457	54	507	59	557	68
408	54	458	54	508	59	558	68
409	55	459	55	509	59	559	68
410	54	460	56	510	59	560	68
411	54	461	56	511	59	561	68
412	54	462	57	512	58	562	68
413	54	463	55	513	58	563	69
414	54	464	55	514	57	564	69
415	54	465	56	515	58	565	69
416	52	466	54	516	58	566	69
417	52	467	54	517	57	567	69
418	52	468	55	518	57	568	69
419	51	469	56	519	57	569	69
420	51	470	57	520	57	570	69
421	51	471	57	521	57	571	69
422	50	472	57	522	58	572	70
423	52	473	57	523	58	573	70
424	52	474	57	524	59	574	70
425	52	475	57	525	58	575	70
426	52	476	57	526	58	576	71
427	52	477	57	527	58	577	70
428	52	478	57	528	58	578	69
429	53	479	55	529	58	579	69
430	54	480	55	530	59	580	70
431	52	481	55	531	59	581	70
432	52	482	55	532	59	582	70
433	52	483	55	533	59	583	70
434	53	484	55	534	60	584	70
435	52	485	55	535	61	585	69
436	51	486	55	536	61	586	69
437	51	487	56	537	61	587	69
438	52	488	56	538	61	588	69
439	52	489	57	539	61	589	69
440	54	490	58	540	61	590	69
441	54	491	58	541	61	591	69
442	53	492	58	542	61	592	68
443	53	493	58	543	62	593	67
444	52	494	59	544	62	594	68
445	52	495	59	545	62	595	67
446	52	496	59	546	62	596	68
447	52	497	59	547	63	597	68
448	52	498	59	548	65	598	68
449	52	499	60	549	66	599	68
450	52	500	60	550	67	600	68

The summary statistics are shown in Table 24 for nonfreeway operation and in Table 25 for freeway operation. The sample sizes are given in seconds, the average speed and its standard deviation in mph, and the acceleration and deceleration rates in mph per second.

Examination of the results shown in Tables 24 and 25 reveals first that the CAPE-21 sample sizes are very much larger than the St. Louis sample sizes and that the nonfreeway sample is larger than the freeway sample in all but one case. (The single exception is the category of Los Angeles diesel trucks, where the freeway sample is larger than the nonfreeway sample.) The average speeds were compared with the Student-t test and each speed was significantly different from each other speed at essentially the 100 percent confidence level. This result, of course, is due to the very large sample sizes.

In the case of the nonfreeway average speeds, the highest averages were achieved in Los Angeles, the lowest in New York, and the St. Louis average speeds are in between, although closest to Los Angeles. Note also that the average speed tends to be inversely proportional to the percent idle parameter (Reference 5). For the nonfreeway data samples, then, New York and Los Angeles do exhibit average-speed extremes. Note also that the average acceleration and deceleration rates are higher for Los Angeles and New York trucks than for St. Louis trucks. The St. Louis bus average acceleration rate, however, is slightly higher than that for New York and Los Angeles buses. Although the differences are statistically significant because of the large sample sizes, they are of small operational consequence.

In the case of the freeway data, the St. Louis average speeds are always larger than those for Los Angeles and New York. The St. Louis sample sizes, however, are very small and the data sample may not be representative. In particular, note the smaller idle percentages on the St. Louis freeways, including the zero idle percentage for just over 42 minutes of St. Louis bus operation. The average acceleration and deceleration rates for St. Louis are, again, smaller than those for Los Angeles and New York.

In view of the sample-size limitations of the St. Louis data, then, it is concluded that these comparisons support the assumption that New York and Los Angeles represent extreme of heavy-duty vehicle speed operation to a greater degree than they may negate the assumption. If average acceleration and deceleration rates were used as criteria, then St. Louis and New York represent the extremes. It is clear, however, that more St. Louis data and further in-depth analysis are required for a definitive comparison.

Table 24. SUMMARY STATISTICS

TRUCKS: URBAN NON-FREEWAY

	SAMPLE SIZE	AVERAGE SPEED	STANDARD DEVIATION	AVERAGE ACCEL RATE	AVERAGE DECEL RATE	% IDLE	% CRUISE	% ACCEL	% DECEL
SL GAS	120460	13.10	12.75	1.60	-1.79	32.26	24.89	23.49	19.37
LA GAS	695983	15.66	14.78	1.70	-1.94	27.83	30.86	22.87	18.44
NY GAS	1190443	7.54	11.05	1.74	-1.86	50.20	20.44	15.32	14.04
SL DSL	56604	13.59	13.82	1.45	-1.70	33.12	28.59	21.63	16.66
LA DSL	371201	14.06	15.42	1.49	-1.75	34.33	34.19	18.20	13.28
NY DSL	724857	8.24	12.07	1.59	-1.74	51.78	20.17	14.96	13.10
SL ALL	177064	13.25	13.10	1.55	-1.76	32.53	26.07	22.89	18.50
LA ALL	1067184	15.10	15.02	1.63	-1.90	30.09	32.02	21.24	16.65
NY ALL	1915300	7.80	11.45	1.68	-1.82	50.80	20.34	15.18	13.69

BUSES: URBAN NON-FREEWAY

	SAMPLE SIZE	AVERAGE SPEED	STANDARD DEVIATION	AVERAGE ACCEL RATE	AVERAGE DECEL RATE	% IDLE	% CRUISE	% ACCEL	% DECEL
SL BUS	33268	11.48	12.71	1.79	-2.08	34.67	16.31	27.25	21.78
LA BUS	219322	16.07	13.30	1.76	-2.09	20.11	24.27	31.51	24.11
NY BUS	467773	8.52	9.43	1.71	-1.86	33.33	19.20	25.54	21.93

Table 25. SUMMARY STATISTICS

TRUCKS: URBAN FREEWAY

	SAMPLE SIZE	AVERAGE SPEED	STANDARD DEVIATION	AVERAGE ACCEL RATE	AVERAGE DECEL RATE	% IDLE	% CRUISE	% ACCEL	% DECEL
SL GAS	17614	47.11	10.03	1.13	-1.25	0.60	63.48	19.69	16.23
LA GAS	465245	44.91	14.30	1.37	-1.59	2.60	72.94	13.50	10.95
NY GAS	153265	29.94	18.08	1.67	-1.85	9.27	45.85	23.13	21.75
SL DSL	13269	48.83	11.11	1.06	-1.22	1.24	65.29	19.30	14.18
LA DSL	411987	46.26	13.44	1.27	-1.37	2.03	76.92	12.03	9.01
NY DSL	159247	24.85	19.20	1.42	-1.50	21.23	40.01	20.15	18.61
SL ALL	30883	47.85	10.54	1.10	-1.24	0.87	64.26	19.53	15.35
LA ALL	877293	45.54	13.92	1.33	-1.49	2.33	74.81	12.81	10.04
NY ALL	312513	27.35	18.83	1.55	-1.69	15.36	42.87	21.61	20.15

BUSES: URBAN FREEWAY

	SAMPLE SIZE	AVERAGE SPEED	STANDARD DEVIATION	AVERAGE ACCEL RATE	AVERAGE DECEL RATE	% IDLE	% CRUISE	% ACCEL	% DECEL
SL BUS	2539	55.70	6.01	1.03	-1.05	0.0	64.75	20.64	14.61
LA BUS	35903	44.03	14.95	1.33	-1.67	2.01	64.90	18.82	14.28
NY BUS	2835	30.19	13.34	1.63	-1.87	2.07	30.87	37.51	29.56

REFERENCES

1. E.M. Sheehan, and J.T. Kretzer, "Driving Patterns of Heavy-Duty Vehicles Operating in the St. Louis Regional Area," Report No. EPA-460/3-76-007, April 1976.

2. Malcolm Smith and David Weston, "Construction of Chassis Dynamometer Test Cycles," Volume 1, Final Report, Scott Research Labs, Inc., SRL Report No. 2948-06-0871, November 1971.

3. Malcolm Smith and David Weston, "A Technique for Generating Representative Driving Cycles," Paper No. 72-165 presented at the 65th Meeting of the Air Pollution Control Association, June 1972.

4. Sidney Siegel, "Nonparametric Statistics for the Behavioral Sciences," McGraw-Hill Book Company, 1956.

5. Malcolm Smith and Tom Aldrich, "Development of Revised Light-Duty Vehicle Average Speed Relationships," Report No. EPA-460/3-77-011

Appendix A

EXAMPLES OF GENERATED OUTPUT

This appendix contains the output generated for the following trucks:

Vehicle Number	Axle Configuration	Fuel Type
17	2 S.U.	Gas
54	3 S.U.	Gas
49	TT	Gas
67	2 S.U.	Diesel
3	3 S.U.	Diesel
2	Bus	Diesel

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171969CHEV       2          TRASH TRUCK TRASH      CHEV      08                G63033
LOCAL30764CE62988534233393272YKAN BROS. 3350 N 14CFLORRISANT MO.63033             43

 ST. LOUIS   VEH. NO. 17                               SPEED DENSITY AND DISTRIBUTION FUNCTIONS

        SPEED      FREQUENCY     DENSITY    DISTRIBUTION                        SPEED      FREQUENCY     DENSITY    DISTRIBUTION

        ZERO         10673        64.94                                           40           82         0.50         91.41
          0          10750        65.41        65.41                              41           86         0.52         91.94
          1            160         0.97        66.39                              42           54         0.33         92.27
          2            231         1.41        67.79                              43           57         0.35         92.61
          3            255         1.55        69.34                              44           56         0.34         92.95
          4            245         1.49        70.83                              45           52         0.32         93.27
          5            261         1.59        72.42                              46           57         0.35         93.62
          6            257         1.56        73.99                              47           44         0.27         93.88
          7            254         1.55        75.53                              48           29         0.18         94.06
          8            236         1.44        76.97                              49           33         0.20         94.26
          9            181         1.10        78.07                              50           41         0.25         94.51
         10            176         1.07        79.14                              51           40         0.24         94.75
         11            128         0.78        79.92                              52           66         0.40         95.16
         12            108         0.66        80.58                              53           46         0.28         95.44
         13             68         0.41        80.99                              54          102         0.62         96.06
         14             69         0.42        81.41                              55           87         0.53         96.59
         15             64         0.39        81.80                              56           78         0.47         97.06
         16             63         0.38        82.18                              57           78         0.47         97.54
         17             63         0.38        82.57                              58          124         0.75         98.29
         18             38         0.23        82.80                              59          115         0.70         98.99
         19             50         0.30        83.10                              60           78         0.47         99.46
         20             50         0.30        83.41                              61           54         0.33         99.79
         21             53         0.32        83.73                              62           18         0.11         99.90
         22             58         0.35        84.08                              63           13         0.08         99.98
         23             49         0.30        84.38                              64            3         0.02        100.00
         24             43         0.26        84.64                              65            0         0.0         100.00
         25             45         0.27        84.92                              66            0         0.0         100.00
         26             48         0.29        85.21                              67            0         0.0         100.00
         27             56         0.34        85.55                              68            0         0.0         100.00
         28             53         0.32        85.87                              69            0         0.0         100.00
         29             63         0.38        86.25                              70            0         0.0         100.00
         30             54         0.33        86.58                              71            0         0.0         100.00
         31             54         0.33        86.91                              72            0         0.0         100.00
         32             51         0.31        87.22                              73            0         0.0         100.00
         33             55         0.33        87.56                              74            0         0.0         100.00
         34             45         0.27        87.83                              75            0         0.0         100.00
         35             84         0.51        88.34                              76            0         0.0         100.00
         36             95         0.58        88.92                              77            0         0.0         100.00
         37            108         0.66        89.58                              78            0         0.0         100.00
         38            108         0.66        90.23                              79            0         0.0         100.00
         39            112         0.68        90.91                              80            0         0.0         100.00

                                                          N        =  16434
                                                          AVGE     =   8.41
                                                          STD DEV  =  16.36
```

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171969CHEV      2         TRASH TRUCK TRASH     CHEV      08              G63033
LCCAL30764CE6298853423339327ZYKAN BROS. 3350 N 14CFLCRRISANT MO.63033        43

 ST. LOUIS  VEH. NO. 17                          INITIAL SPEED VS. DELTA SPEED MATRIX
                                                            (N =  16422)

 SPEED  -10   -9   -8   -7   -6   -5   -4   -3   -2   -1     0    1    2    3    4    5    6    7    8    9   10

    0     0    0    0    0    0    0    0    0    0    0 10616   61   34   17   11    3    1    2    2    0    1
    1     0    0    0    0    0    0    0    0    0   62    28   33   24   11    1    0    0    0    0    0    0
    2     0    0    0    0    0    0    0    0   72   51    31   30   24   22    0    0    0    0    0    0    0
    3     0    0    0    0    0    0    0   45   36   50    56   27   20   16    3    0    0    0    0    0    0
    4     0    0    0    0    0    0   16   12   39   57    50   27   25   11    3    1    0    0    0    0    0
    5     0    0    0    0    0   12    2   11   39   65    60   31   25   13    3    0    0    0    0    0    0
    6     0    0    0    0    9    1    7   19   37   63    51   36   24    8    2    0    0    0    0    0    0
    7     0    0    0    1    0    3    3   14   38   51    74   38   18   13    0    0    0    0    0    0    0
    8     0    0    0    0    0    1    4   20   32   45    56   46   20   11    1    0    0    0    0    0    0
    9     0    0    0    0    0    1    8   10   24   25    52   33   14    9    4    1    0    0    0    0    0
   10     0    0    0    0    0    1    4   15   25   36    45   27   19    3    1    0    0    0    0    0    0
   11     1    0    0    0    0    3    6   10   10   27    35   18   11    7    0    0    0    0    0    0    0
   12     0    0    0    0    1    2    2    3   15   24    22   21   12    5    1    0    0    0    0    0    0
   13     0    0    0    0    0    1    3    4   10    8    11    9   13    6    3    0    0    0    0    0    0
   14     0    0    0    1    0    1    5    5    8    8    16   15    8    1    1    0    0    0    0    0    0
   15     0    0    0    0    0    1    2   11    8    6     6   15   12    2    1    0    0    0    0    0    0
   16     0    0    0    0    0    0    1    2    3   12    19   12    8    6    0    0    0    0    0    0    0
   17     0    0    0    0    0    2    4    9    8    7     8   12   12    0    1    0    0    0    0    0    0
   18     0    0    0    0    0    0    2    4    2    6     4   12    5    3    0    0    0    0    0    0    0
   19     0    0    0    0    0    0    1    5    6    4     4   15   10    4    1    0    0    0    0    0    0
   20     0    0    0    0    1    2    1    6    5    9     5   12    6    3    0    0    0    0    0    0    0
   21     0    0    0    1    0    1    3    3    4    7    10   11   10    2    1    0    0    0    0    0    0
   22     0    0    0    0    0    2    1    6    9    4    13   15    4    4    0    0    0    0    0    0    0
   23     0    0    0    0    0    0    1    2    3    3    19   15    6    0    0    0    0    0    0    0    0
   24     0    0    0    0    0    0    0    6    4    4     5   15    6    1    1    0    0    0    0    0    0
   25     0    0    0    0    1    1    2    7    3    7     2   14    8    0    0    0    0    0    0    0    0
   26     0    0    0    0    0    1    0    1    4    6    12   18    6    0    0    0    0    0    0    0    0
   27     0    0    0    0    2    0    0    3    2    7    22   16    4    0    0    0    0    0    0    0    0
   28     0    0    0    0    0    0    1    5    3    7    15   18    3    1    0    0    0    0    0    0    0
   29     0    0    0    0    1    0    1    3    5    9    19   22    3    0    0    0    0    0    0    0    0
   30     0    0    0    0    0    1    0    0    3    6    17   22    5    0    0    0    0    0    0    0    0
   31     0    0    0    0    0    1    1    4    3   12    15   17    0    1    0    0    0    0    0    0    0
   32     0    0    0    0    0    0    0    2    2    5    20   21    1    0    0    0    0    0    0    0    0
   33     0    0    0    0    1    0    0    2    5    9    20   17    1    0    0    0    0    0    0    0    0
   34     0    0    0    0    0    0    0    1    1    6    19   16    1    1    0    0    0    0    0    0    0
   35     0    0    0    0    0    0    1    0    3   11    48   20    1    0    0    0    0    0    0    0    0
   36     0    0    0    0    0    1    0    0    4   15    51   23    1    0    0    0    0    0    0    0    0
   37     0    0    0    0    0    1    0    0    0   22    61   23    1    0    0    0    0    0    0    0    0
   38     0    0    0    0    0    0    0    1    0   15    75   15    2    0    0    0    0    0    0    0    0
   39     0    0    0    0    0    0    1    0    3   17    76   13    2    0    0    0    0    0    0    0    0
   40     0    0    0    0    0    0    0    1    0   11    54   14    2    0    0    0    0    0    0    0    0
   41     0    0    0    0    0    0    0    1    0   16    58   10    1    0    0    0    0    0    0    0    0
   42     0    0    0    0    0    0    0    1    2   10    28   12    1    0    0    0    0    0    0    0    0
   43     0    0    0    0    0    0    0    0    1    4    41   11    0    0    0    0    0    0    0    0    0
   44     0    0    0    0    0    0    0    0    1    7    34   13    1    0    0    0    0    0    0    0    0
   45     0    0    0    0    0    0    0    1    1    9    28   13    0    0    0    0    0    0    0    0    0
```

```
171969CHEV      2          TRASH TRUCK TRASH     CHEV      08
LOCAL30764CE6298853423339327ZYKAN BROS. 3350 N 140FLORRISANT MO.63033          G63033
                                                                                   43

ST. LOUIS  VEH. NO. 17
                                           INITIAL SPEED VS. DELTA SPEED MATRIX
                                                        (N =  16422)

SPEED  -10   -9   -8   -7   -6   -5   -4   -3   -2   -1     0     1    2    3    4    5    6    7    8    9

  46     0    0    0    0    0    0    0    1    1   10    34    11    0    0    0    0    0    0    0    0
  47     0    0    0    0    0    0    0    0    1    8    25    10    0    0    0    0    0    0    0    0
  48     0    0    0    0    0    0    0    0    1    5    16     7    0    0    0    0    0    0    0    0
  49     0    0    0    0    0    0    0    0    0    5    20     8    0    0    0    0    0    0    0    0
  50     0    0    0    0    0    0    0    0    0    3    32     6    0    0    0    0    0    0    0    0
  51     0    0    0    0    0    0    0    0    0    6    26     8    0    0    0    0    0    0    0    0
  52     0    0    0    0    0    0    0    0    0    7    52     7    0    0    0    0    0    0    0    0
  53     0    0    0    0    0    0    0    0    0    7    33     5    1    0    0    0    0    0    0    0
  54     0    0    0    0    0    0    0    0    0    6    83    13    0    0    0    0    0    0    0    0
  55     0    0    0    0    0    0    0    0    0    9    55    23    0    0    0    0    0    0    0    0
  56     0    0    0    0    0    0    0    0    1   14    47    15    1    0    0    0    0    0    0    0
  57     0    0    0    0    0    0    0    0    0    7    62     9    0    0    0    0    0    0    0    0
  58     0    0    0    0    0    0    0    0    0    6   106    12    0    0    0    0    0    0    0    0
  59     0    0    0    0    0    0    0    0    0    5   104     6    0    0    0    0    0    0    0    0
  60     0    0    0    0    0    0    0    0    0    1    76     1    0    0    0    0    0    0    0    0
  61     0    0    0    0    0    0    0    0    0    2    52     0    0    0    0    0    0    0    0    0
  62     0    0    0    0    0    0    0    0    0    1    11     6    0    0    0    0    0    0    0    0
  63     0    0    0    0    0    0    0    0    0    4     7     2    0    0    0    0    0    0    0    0
  64     0    0    0    0    0    0    0    0    0    3     0     0    0    0    0    0    0    0    0    0
  65     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  66     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  67     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  68     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  69     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  70     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  71     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  72     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  73     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  74     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  75     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  76     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  77     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  78     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  79     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  80     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0

TOTAL    1    0    0    3   16   40   83  256  487  954 12852  1083  416  181   39    5    1    2    2    0

                              PERCENT OF TIME AT IDLE                      = 65.45

                              AVERAGE SPEED COMPUTED FROM MATRIX           =  8.43

                              AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.55

                              AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.82
```

```
171969CHEV        2          TRASH TRUCK TRASH      CHEV      C8              G63033
LCCAL30764CE62988534233393272YKAN BROS. 3350 N 140FLORRISANT MO.63033            43

ST. LOUIS  VEH. NO. 17                            INITIAL SPEED VS. DELTA SPEED MATRIX
                                                              (N =  16422)

SPEED   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9    10
 *
   0      0     0     0     0     0     0     0     0    72   113 10675   124    82    50    12     3     1     2     2     0     1
   5      0     0     0     1     5    16    28   101   189   286   291   159   112    61    11     1     0     0     0     0     0
  10      1     0     0     0     1     8    24    58   106   157   210   145    76    35     7     1     0     0     0     0     0
  15      0     0     0     1     0     5    15    31    37    41    60    63    53    15     6     0     0     0     0     0     0
  20      0     0     0     1     1     5     8    24    26    30    36    65    35    16     2     0     0     0     0     0     0
  25      0     0     0     0     3     2     3    19    16    27    60    78    30     1     1     0     0     0     0     0     0
  30      0     0     0     0     1     2     3    14    16    39    86   100    12     2     0     0     0     0     0     0     0
  35      0     0     0     0     1     2     1     3    13    63   199    99     5     1     0     0     0     0     0     0     0
  40      0     0     0     0     0     0     1     4     5    69   291    64     8     0     0     0     0     0     0     0     0
  45      0     0     0     0     0     0     0     2     5    38   162    58     1     0     0     0     0     0     0     0     0
  50      0     0     0     0     0     0     0     0     1    26   146    36     0     0     0     0     0     0     0     0     0
  55      0     0     0     0     0     0     0     0     1    43   280    65     2     0     0     0     0     0     0     0     0
  60      0     0     0     0     0     0     0     0     0    15   349    25     0     0     0     0     0     0     0     0     0
  65      0     0     0     0     0     0     0     0     0     7     7     2     0     0     0     0     0     0     0     0     0
  70      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  75      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  80      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

TOTAL     1     0     0     3    16    40    83   256   487   954 12852  1083   416   181    39     5     1     2     2     0     1

                                    PERCENT OF TIME AT IDLE                   = 67.82

                                    AVERAGE SPEED COMPUTED FROM MATRIX        =  8.42

                                    AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.55

                                    AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.82
```

```
171969CHEV       2         TRASH TRUCK TRASH     CHEV      08                G63033
LOCAL30764CE629885342333932ZYKAN BROS. 3350 N 14CFLORRISANT MO.63033             43


 ST. LOUIS  VEH. NO. 17                             DISTRIBUTION OF ROLLING STOPS

      SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                   MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
      (UP TO)                                                        (UP TO)

         1          0         0.0         0.0                           1          0          0.0       100.00
         2          2        25.00       25.00                          2          0          0.0       100.00
         3          4        50.00       75.00                          3          0          0.0       100.00
         4          1        12.50       87.50                          4          0          0.0       100.00
         5          0         0.0        87.50                          5          0          0.0       100.00
         6          0         0.0        87.50                          6          0          0.0       100.00
         7          0         0.0        87.50                          7          0          0.0       100.00
         8          0         0.0        87.50                          8          0          0.0       100.00
         9          1        12.50      100.00                          9          0          0.0       100.00
        10          0         0.0       100.00                         10          0          0.0       100.00
        11          0         0.0       100.00                         11          0          0.0       100.00
        12          0         0.0       100.00                         12          0          0.0       100.00
        13          0         0.0       100.00                         13          0          0.0       100.00
        14          0         0.0       100.00                         14          0          0.0       100.00
        15          0         0.0       100.00                         15          0          0.0       100.00
        16          0         0.0       100.00                         20          0          0.0       100.00
        17          0         0.0       100.00                         25          0          0.0       100.00
        18          0         0.0       100.00                         30          0          0.0       100.00
        19          0         0.0       100.00                         35          0          0.0       100.00
        20          0         0.0       100.00                         40          0          0.0       100.00
        22          0         0.0       100.00                         45          0          0.0       100.00
        24          0         0.0       100.00                         50          0          0.0       100.00
        26          0         0.0       100.00                         55          0          0.0       100.00
        28          0         0.0       100.00                         60          0          0.0       100.00
        30          0         0.0       100.00
        32          0         0.0       100.00
        34          0         0.0       100.00
        36          0         0.0       100.00
        38          0         0.0       100.00
        40          0         0.0       100.00
        42          0         0.0       100.00
        44          0         0.0       100.00
        46          0         0.0       100.00
        48          0         0.0       100.00
        50          0         0.0       100.00
        52          0         0.0       100.00
        54          0         0.0       100.00
        56          0         0.0       100.00
        58          0         0.0       100.00

                                              NUMBER OF STOPS     =      8
                                              AVERAGE TIME/STOP   =   3.63  SECONDS
                                              TOTAL VEH. MILES    =  38.46
                                              AV. NO. STOPS/MILE  =   0.21
```

```
171969CHEV       2          TRASH TRUCK TRASH     CHEV      08              063033
LOCAL30764OE6298853423339327ZYKAN BROS. 3350 N 14OFLORRISANT MO.63033         43


ST. LOUIS  VEH. NO. 17                          DISTRIBUTION OF FULL STOPS

       SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                  MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
       (UP TO)                                                       (UP TO)

          1          4         1.58        1.58                         1          2         0.79        86.17
          2          3         1.19        2.77                         2         29        11.46        97.63
          3          3         1.19        3.95                         3          2         0.79        98.42
          4          2         0.79        4.74                         4          1         0.40        98.81
          5          2         0.79        5.53                         5          1         0.40        99.21
          6          3         1.19        6.72                         6          0         0.0         99.21
          7          6         2.37        9.09                         7          0         0.0         99.21
          8          2         0.79        9.88                         8          0         0.0         99.21
          9          4         1.58       11.46                         9          0         0.0         99.21
         10          5         1.98       13.44                        10          2         0.79       100.00
         11          1         0.40       13.83                        11          0         0.0        100.00
         12          7         2.77       16.60                        12          0         0.0        100.00
         13          8         3.16       19.76                        13          0         0.0        100.00
         14          6         2.37       22.13                        14          0         0.0        100.00
         15          6         2.37       24.51                        15          0         0.0        100.00
         16          5         1.98       26.48                        20          0         0.0        100.00
         17          4         1.58       28.06                        25          0         0.0        100.00
         18          7         2.77       30.83                        30          0         0.0        100.00
         19          8         3.16       33.99                        35          0         0.0        100.00
         20          7         2.77       36.76                        40          0         0.0        100.00
         22         10         3.95       40.71                        45          0         0.0        100.00
         24          6         2.37       43.08                        50          0         0.0        100.00
         26          7         2.77       45.85                        55          0         0.0        100.00
         28          6         2.37       48.22                        60          0         0.0        100.00
         30          5         1.98       50.20                        65          0         0.0        100.00
         32          6         2.37       52.57                        70          0         0.0        100.00
         34          6         2.37       54.94                        75          0         0.0        100.00
         36          6         2.37       57.31                        80          0         0.0        100.00
         38          9         3.56       60.87                        85          0         0.0        100.00
         40          8         3.16       64.03                        90          0         0.0        100.00
         42          4         1.58       65.61                        95          0         0.0        100.00
         44          5         1.98       67.59                       100          0         0.0        100.00
         46          9         3.56       71.15                       105          0         0.0        100.00
         48          6         2.37       73.52                       110          0         0.0        100.00
         50          7         2.77       76.28                       115          0         0.0        100.00
         52          8         3.16       79.45                       120          0         0.0        100.00
         54          7         2.77       82.21                       125          0         0.0        100.00
         56          4         1.58       83.79                       130          0         0.0        100.00
         58          4         1.58       85.38                       135          0         0.0        100.00

                                         NUMBER OF STOPS     =    253
                                         AVERAGE TIME/STOP   =  40.70   SECONDS
                                         TOTAL VEH. MILES    =  38.46
                                         AV. NO. STOPS/MILE  =   6.58
```

```
171969CHEV       2          TRASH TRUCK TRASH      CHEV      OB              G63033
LOCAL30764CE6298853423339327ZYKAN BROS. 3350 N 140FLORRISANT MO.63033         43


ST. LOUIS  VEH. NO. 17
                                              DISTRIBUTION OF ENGINE-OFF STOPS

                                           MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
                                           (UP TO)

                                               1         2        50.00       50.00
                                               2         0         0.0        50.00
                                               3         0         0.0        50.00
                                               4         0         0.0        50.00
                                               5         0         0.0        50.00
                                               6         0         0.0        50.00
                                               7         1        25.00       75.00
                                               8         0         0.0        75.00
                                               9         0         0.0        75.00
                                              10         0         0.0        75.00
                                              15         1        25.00      100.00
                                              20         0         0.0       100.00
                                              25         0         0.0       100.00
                                              30         0         0.0       100.00
                                              35         0         0.0       100.00
                                              40         0         0.0       100.00
                                              45         0         0.0       100.00
                                              50         0         0.0       100.00
                                              55         0         0.0       100.00
                                              60         0         0.0       100.00
                                              75         0         0.0       100.00
                                              90         0         0.0       100.00
                                             105         0         0.0       100.00
                                             120         0         0.0       100.00
                                             135         0         0.0       100.00
                                             150         0         0.0       100.00
                                             165         0         0.0       100.00
                                             180         0         0.0       100.00
                                             195         0         0.0       100.00
                                             210         0         0.0       100.00
                                             225         0         0.0       100.00
                                             240         0         0.0       100.00
                                             300         0         0.0       100.00
                                             360         0         0.0       100.00
                                             420         0         0.0       100.00
                                             480         0         0.0       100.00

                                               NUMBER OF STOPS     =      4
                                               AVERAGE TIME/STOP   =   5.61   MINUTES
                                               TOTAL VEH. MILES    =  38.46
                                               AV. NO. STOPS/MILE  =   0.10
```

```
541973INTERNAT  3         BULK        TANK       INTERNAT  08           G63110
LOCAL48 50256811C09133974388SUN OIL CO. 5101 MANCH ST.LOUIS,MO.63110       118

 ST. LOUIS  VEH. NO. 54                      SPEED DENSITY AND DISTRIBUTION FUNCTIONS

     SPEED     FREQUENCY    DENSITY   DISTRIBUTION                  SPEED     FREQUENCY    DENSITY   DISTRIBUTION

      ZERO         777        5.62                                    40          346        2.50        70.02
        0          837        6.05        6.05                        41          295        2.13        72.16
        1          104        0.75        6.80                        42          404        2.92        75.08
        2           50        0.36        7.16                        43          522        3.77        78.85
        3           81        0.59        7.75                        44          440        3.18        82.03
        4           88        0.64        8.39                        45          439        3.17        85.20
        5          121        0.87        9.26                        46          422        3.05        88.25
        6          139        1.00       10.26                        47          436        3.15        91.40
        7          104        0.75       11.02                        48          512        3.70        95.11
        8          121        0.87       11.89                        49          356        2.57        97.68
        9          120        0.87       12.76                        50          211        1.53        99.20
       10          158        1.14       13.90                        51           74        0.53        99.74
       11          141        1.02       14.92                        52           29        0.21        99.95
       12          141        1.02       15.94                        53            7        0.05       100.00
       13          175        1.26       17.20                        54            0        0.0        100.00
       14          203        1.47       18.67                        55            0        0.0        100.00
       15          204        1.47       20.15                        56            0        0.0        100.00
       16          197        1.42       21.57                        57            0        0.0        100.00
       17          177        1.28       22.85                        58            0        0.0        100.00
       18          188        1.36       24.21                        59            0        0.0        100.00
       19          197        1.42       25.63                        60            0        0.0        100.00
       20          224        1.62       27.25                        61            0        0.0        100.00
       21          236        1.71       28.96                        62            0        0.0        100.00
       22          228        1.65       30.61                        63            0        0.0        100.00
       23          244        1.76       32.37                        64            0        0.0        100.00
       24          263        1.90       34.27                        65            0        0.0        100.00
       25          270        1.95       36.22                        66            0        0.0        100.00
       26          295        2.13       38.35                        67            0        0.0        100.00
       27          265        1.92       40.27                        68            0        0.0        100.00
       28          284        2.05       42.32                        69            0        0.0        100.00
       29          323        2.33       44.66                        70            0        0.0        100.00
       30          302        2.18       46.84                        71            0        0.0        100.00
       31          322        2.33       49.17                        72            0        0.0        100.00
       32          283        2.05       51.21                        73            0        0.0        100.00
       33          252        1.82       53.04                        74            0        0.0        100.00
       34          295        2.13       55.17                        75            0        0.0        100.00
       35          282        2.04       57.21                        76            0        0.0        100.00
       36          331        2.39       59.60                        77            0        0.0        100.00
       37          394        2.85       62.45                        78            0        0.0        100.00
       38          356        2.57       65.02                        79            0        0.0        100.00
       39          346        2.50       67.52                        80            0        0.0        100.00

                                                  N       =  13834
                                                  AVGE    =  29.52
                                                  STD DEV =  14.81
```

541973INTERNAT 3 BULK TANK INTERNAT 08 G63110
LOCAL48 50256811C09133974339SUN OIL CO. 5101 MANCH ST.LOUIS,MO.63110 118

ST. LOUIS VEH. NO. 54

INITIAL SPEED VS. DELTA SPEED MATRIX
(N = 13824)

SPEED	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0	796	24	11	5	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	31	32	15	12	10	1	0	0	0	0	0
2	0	0	0	0	0	0	0	0	6	16	6	6	3	7	4	0	0	0	0	0
3	0	0	0	0	0	0	0	5	17	5	11	13	11	11	5	0	0	0	0	0
4	0	0	0	0	0	0	1	8	9	5	25	15	12	8	4	0	0	0	0	0
5	0	0	0	0	0	0	2	8	12	18	44	16	11	8	2	0	0	0	0	0
6	0	0	0	0	0	0	1	7	9	14	36	31	30	8	1	2	0	0	0	0
7	0	0	0	0	0	0	4	8	7	20	71	22	16	6	0	0	0	0	0	0
8	0	0	0	0	0	1	7	6	13	15	19	23	27	8	2	0	0	0	0	0
9	0	0	0	0	0	2	8	7	13	11	21	31	19	7	1	0	0	0	0	0
10	0	0	1	0	1	2	7	6	14	9	47	46	17	8	0	0	0	0	0	0
11	0	0	0	0	0	1	8	7	9	16	23	42	29	5	1	0	0	0	0	0
12	0	0	0	0	0	1	9	11	11	11	27	41	23	6	1	0	0	0	0	0
13	0	0	0	0	0	3	5	10	12	18	46	57	22	2	0	0	0	0	0	0
14	0	0	0	0	3	3	4	7	12	15	71	62	25	1	0	0	0	0	0	0
15	0	0	0	0	0	7	2	12	12	29	55	67	16	4	0	0	0	0	0	0
16	0	0	0	0	0	0	10	4	17	18	54	67	24	3	0	0	0	0	0	0
17	0	0	0	0	0	5	4	9	13	24	45	59	16	2	0	0	0	0	0	0
18	0	0	0	0	0	1	4	9	18	18	52	59	25	2	0	0	0	0	0	0
19	0	0	0	0	0	0	4	12	18	17	69	59	18	0	0	0	0	0	0	0
20	0	0	0	0	1	1	5	3	20	29	70	70	23	2	0	0	0	0	0	0
21	0	0	0	0	1	1	2	5	16	30	88	82	10	1	0	0	0	0	0	0
22	0	0	0	0	0	1	1	10	17	36	77	75	11	0	0	0	0	0	0	0
23	0	0	0	0	0	1	3	4	11	35	99	85	5	1	0	0	0	0	0	0
24	0	0	0	0	1	2	3	5	16	36	119	76	5	0	0	0	0	0	0	0
25	0	0	0	0	0	1	1	7	11	28	131	85	6	0	0	0	0	0	0	0
26	0	0	0	0	0	0	2	3	16	36	150	82	5	1	0	0	0	0	0	0
27	0	0	0	0	0	0	3	3	8	46	111	89	5	0	0	0	0	0	0	0
28	0	0	0	0	0	1	1	5	10	47	130	85	5	0	0	0	0	0	0	0
29	0	0	0	0	0	1	0	2	9	39	132	81	9	0	0	0	0	0	0	0
30	0	0	0	0	0	0	1	3	10	40	171	75	2	0	0	0	0	0	0	0
31	0	0	0	0	0	0	2	3	7	46	168	69	7	0	0	0	0	0	0	0
32	0	0	0	0	0	0	2	1	8	48	143	79	2	0	0	0	0	0	0	0
33	0	0	0	0	0	0	1	1	8	43	130	65	4	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	2	9	47	154	77	6	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	1	9	46	152	70	4	0	0	0	0	0	0	0
36	0	0	0	0	0	0	2	0	7	53	203	64	2	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	5	49	272	67	1	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	5	51	234	65	1	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	2	2	46	233	62	1	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	2	38	246	58	2	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	1	6	39	202	44	3	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	4	42	245	61	2	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	3	39	401	78	1	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	1	52	301	82	4	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	1	2	63	274	78	1	0	0	0	0	0	0	0

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541973INTERNAT  3        BULK        TANK       INTERNAT  08             G63110
LOCAL48 50256811C09133974388SUN OIL CO. 5101 MANCH ST.LOUIS,MO.63110       118

                                         INITIAL SPEED VS. DELTA SPEED MATRIX
ST. LOUIS  VEH. NO. 54                             (N =  13324)

SPEED   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9    10
   46     0     0     0     0     0     0     0     0     0    55   310    56     1     0     0     0     0     0     0     0     0
   47     0     0     0     0     0     0     0     0     1    52   317    66     0     0     0     0     0     0     0     0     0
   48     0     0     0     0     0     0     0     0     0    48   411    53     0     0     0     0     0     0     0     0     0
   49     0     0     0     0     0     0     0     0     0    33   298    25     0     0     0     0     0     0     0     0     0
   50     0     0     0     0     0     0     0     0     0     9   196     6     0     0     0     0     0     0     0     0     0
   51     0     0     0     0     0     0     0     0     0     2    68     4     0     0     0     0     0     0     0     0     0
   52     0     0     0     0     0     0     0     0     0     1    26     2     0     0     0     0     0     0     0     0     0
   53     0     0     0     0     0     0     0     0     0     0     7     0     0     0     0     0     0     0     0     0     0
   54     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   55     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   56     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   57     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   58     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   59     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   60     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   61     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   62     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   63     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   64     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   65     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   66     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   67     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   68     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   69     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   70     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   71     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   72     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   73     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   74     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   75     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   76     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   77     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   78     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   79     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

TOTAL     0     0     1     0     7    35   109   198   445  1614  7909  2871   495   116    22     2     0     0     0     0     0

                          PERCENT OF TIME AT IDLE                    =  6.05

                          AVERAGE SPEED COMPUTED FROM MATRIX         = 29.56

                          AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.23

                          AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.56
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541973INTERNAT  3          BULK         TANK       INTERNAT  08              G63110
LOCAL48 50256811C09133974388SUN OIL CO. 5101 MANCH ST.LOUIS,MO.63110            118

 ST. LOUIS  VEH. NO. 54                          INITIAL SPEED VS. DELTA SPEED MATRIX
                                                          (N =  13824)

 SPEED   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9

     0     0     0     0     0     0     0     0     0     6    47   834    45    26    22     5     0     0     0     0     0
     5     0     0     0     0     0     0     8    36    54    62   137    97    80    41    12     2     0     0     0     0
    10     0     0     1     0     1     7    39    37    60    62   137   183   115    34     5     0     0     0     0     0
    15     0     0     0     0     3    18    25    42    66   104   271   312   103    12     0     0     0     0     0     0
    20     0     0     0     0     2     4    16    39    89   130   356   345    87     5     0     0     0     0     0     0
    25     0     0     0     0     1     4    12    22    62   181   610   417    26     2     0     0     0     0     0     0
    30     0     0     0     0     0     2     6    14    44   220   814   389    25     0     0     0     0     0     0     0
    35     0     0     0     0     0     0     3     4    38   238   911   343    17     0     0     0     0     0     0     0
    40     0     0     0     0     0     0     0     3    19   216  1210   290     9     0     0     0     0     0     0     0
    45     0     0     0     0     0     0     0     1     7   261  1623   360     7     0     0     0     0     0     0     0
    50     0     0     0     0     0     0     0     0     0    93   999    90     0     0     0     0     0     0     0     0
    55     0     0     0     0     0     0     0     0     0     0     7     0     0     0     0     0     0     0     0     0
    60     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    65     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    70     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    75     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

 TOTAL     0     0     1     0     7    35   109   198   445  1614  7909  2871   495   116    22     2     0     0     0     0


                                      PERCENT OF TIME AT IDLE                =  7.13

                                      AVERAGE SPEED COMPUTED FROM MATRIX     = 29.62

                                      AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.23

                                      AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.56
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541973INTERNAT  3          BULK        TANK       INTERNAT  08              G63110
LOCAL48 50256811C09133974388SUN OIL CO. 5101 MANCH ST.LOUIS,MO.63110          118


ST. LOUIS  VEH. NO. 54                         DISTRIBUTION OF ROLLING STOPS
         SECONDS   FREQUENCY   DENSITY   DISTRIBUTION             MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
         (UP TO)                                                  (UP TO)

            1          3        25.00       25.00                    1          0         0.0       100.00
            2          2        16.67       41.67                    2          0         0.0       100.00
            3          3        25.00       66.67                    3          0         0.0       100.00
            4          3        25.00       91.67                    4          0         0.0       100.00
            5          0         0.0        91.67                    5          0         0.0       100.00
            6          0         0.0        91.67                    6          0         0.0       100.00
            7          0         0.0        91.67                    7          0         0.0       100.00
            8          0         0.0        91.67                    8          0         0.0       100.00
            9          0         0.0        91.67                    9          0         0.0       100.00
           10          1         8.33      100.00                   10          0         0.0       100.00
           11          0         0.0       100.00                   11          0         0.0       100.00
           12          0         0.0       100.00                   12          0         0.0       100.00
           13          0         0.0       100.00                   13          0         0.0       100.00
           14          0         0.0       100.00                   14          0         0.0       100.00
           15          0         0.0       100.00                   15          0         0.0       100.00
           16          0         0.0       100.00                   20          0         0.0       100.00
           17          0         0.0       100.00                   25          0         0.0       100.00
           18          0         0.0       100.00                   30          0         0.0       100.00
           19          0         0.0       100.00                   35          0         0.0       100.00
           20          0         0.0       100.00                   40          0         0.0       100.00
           22          0         0.0       100.00                   45          0         0.0       100.00
           24          0         0.0       100.00                   50          0         0.0       100.00
           26          0         0.0       100.00                   55          0         0.0       100.00
           28          0         0.0       100.00                   60          0         0.0       100.00
           30          0         0.0       100.00
           32          0         0.0       100.00
           34          0         0.0       100.00
           36          0         0.0       100.00
           38          0         0.0       100.00
           40          0         0.0       100.00
           42          0         0.0       100.00
           44          0         0.0       100.00
           46          0         0.0       100.00
           48          0         0.0       100.00
           50          0         0.0       100.00
           52          0         0.0       100.00
           54          0         0.0       100.00
           56          0         0.0       100.00
           58          0         0.0       100.00

                                        NUMBER OF STOPS      =     12
                                        AVERAGE TIME/STOP    =   3.17  SECONDS
                                        TOTAL VEH. MILES     = 113.60
                                        AV. NO. STOPS/MILE =     0.11
```

```
541973INTERNAT  3          BULK         TANK       INTERNAT  06              G63110
LOCAL48 502568110091339743885UN OIL CO. 5101 MANCH ST.LOUIS,MO.63110            118


                                                   DISTRIBUTION OF FULL STOPS
ST. LOUIS   VEH. NO. 54
         SECONDS    FREQUENCY    DENSITY    DISTRIBUTION               MINUTES    FREQUENCY    DENSITY    DISTRIBUTION
         (UP TO)                                                       (UP TO)
                                                                          1           0          0.0        97.78
            1           4          8.89         8.89                      2           1          2.22      100.00
            2           4          8.89        17.78                      3           0          0.0       100.00
            3           3          6.67        24.44                      4           0          0.0       100.00
            4           2          4.44        28.89                      5           0          0.0       100.00
            5           3          6.67        35.56                      6           0          0.0       100.00
            6           1          2.22        37.78                      7           0          0.0       100.00
            7           1          2.22        40.00                      8           0          0.0       100.00
            8           1          2.22        42.22                      9           0          0.0       100.00
            9           2          4.44        46.67                     10           0          0.0       100.00
           10           1          2.22        48.89                     11           0          0.0       100.00
           11           1          2.22        51.11                     12           0          0.0       100.00
           12           2          4.44        55.56                     13           0          0.0       100.00
           13           1          2.22        57.78                     14           0          0.0       100.00
           14           1          2.22        60.00                     15           0          0.0       100.00
           15           0          0.0         60.00                     20           0          0.0       100.00
           16           1          2.22        62.22                     25           0          0.0       100.00
           17           0          0.0         62.22                     30           0          0.0       100.00
           18           0          0.0         62.22                     35           0          0.0       100.00
           19           2          4.44        66.67                     40           0          0.0       100.00
           20           1          2.22        68.89                     45           0          0.0       100.00
           22           3          6.67        75.56                     50           0          0.0       100.00
           24           2          4.44        80.00                     55           0          0.0       100.00
           26           1          2.22        82.22                     60           0          0.0       100.00
           28           0          0.0         82.22                     65           0          0.0       100.00
           30           0          0.0         82.22                     70           0          0.0       100.00
           32           0          0.0         82.22                     75           0          0.0       100.00
           34           0          0.0         82.22                     80           0          0.0       100.00
           36           2          4.44        86.67                     85           0          0.0       100.00
           38           0          0.0         86.67                     90           0          0.0       100.00
           40           1          2.22        88.89                     95           0          0.0       100.00
           42           0          0.0         88.89                    100           0          0.0       100.00
           44           0          0.0         88.89                    105           0          0.0       100.00
           46           2          4.44        93.33                    110           0          0.0       100.00
           48           2          4.44        97.78                    115           0          0.0       100.00
           50           0          0.0         97.78                    120           0          0.0       100.00
           52           0          0.0         97.78                    125           0          0.0       100.00
           54           0          0.0         97.78                    130           0          0.0       100.00
           56           0          0.0         97.78                    135           0          0.0       100.00
           58           0          0.0         97.78

                                         NUMBER OF STOPS     =      45
                                         AVERAGE TIME/STOP   =   16.16   SECONDS
                                         TOTAL VEH. MILES    =  113.60
                                         AV. NO. STOPS/MILE  =    0.40
```

```
541973INTERNAT  3         BULK        TANK       INTERNAT  08              G63110
LOCAL48 50256811C09133974388SUN OIL CO. 5101 MANCH ST.LOUIS,MO.63110         118


ST. LOUIS  VEH. NO. 54                      DISTRIBUTION OF ENGINE-OFF STOPS

                                      MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
                                      (UP TO)

                                          1         0         0.0         0.0
                                          2         0         0.0         0.0
                                          3         0         0.0         0.0
                                          4         0         0.0         0.0
                                          5         0         0.0         0.0
                                          6         0         0.0         0.0
                                          7         0         0.0         0.0
                                          8         0         0.0         0.0
                                          9         0         0.0         0.0
                                         10         0         0.0         0.0
                                         15         3        33.33       33.33
                                         20         2        22.22       55.56
                                         25         1        11.11       66.67
                                         30         0         0.0        66.67
                                         35         1        11.11       77.78
                                         40         0         0.0        77.78
                                         45         1        11.11       88.89
                                         50         1        11.11      100.00
                                         55         0         0.0       100.00
                                         60         0         0.0       100.00
                                         75         0         0.0       100.00
                                         90         0         0.0       100.00
                                        105         0         0.0       100.00
                                        120         0         0.0       100.00
                                        135         0         0.0       100.00
                                        150         0         0.0       100.00
                                        165         0         0.0       100.00
                                        180         0         0.0       100.00
                                        195         0         0.0       100.00
                                        210         0         0.0       100.00
                                        225         0         0.0       100.00
                                        240         0         0.0       100.00
                                        300         0         0.0       100.00
                                        360         0         0.0       100.00
                                        420         0         0.0       100.00
                                        480         0         0.0       100.00

                                            NUMBER OF STOPS     =      9
                                            AVERAGE TIME/STOP  =  24.22  MINUTES
                                            TOTAL VEH. MILES    = 113.60
                                            AV. NO. STOPS/MILE =   0.08
```

```
4919691NTERNAT  2-S1      DELIVERY               INTERNAT  08356208         G63037
SHORT4810141608035620896625IBEUFORT TRAS           GERALD    MC.63037047501761 75

ST. LOUIS  VEH. NO. 49                    SPEED DENSITY AND DISTRIBUTION FUNCTIONS
    SPEED     FREQUENCY    DENSITY   DISTRIBUTION          SPEED     FREQUENCY   DENSITY   DISTRIBUTION

     ZERO        8079       34.54                            40         142        0.61       64.40
       0         8165       34.91       34.91                41         181        0.77       65.17
       1          123        0.53       35.43                42         189        0.81       65.98
       2          150        0.64       36.07                43         185        0.79       66.77
       3          145        0.62       36.69                44         246        1.05       67.82
       4          183        0.78       37.48                45         264        1.13       68.95
       5          164        0.70       38.18                46         250        1.07       70.02
       6          196        0.84       39.01                47         323        1.38       71.40
       7          152        0.65       39.66                48         382        1.63       73.03
       8          165        0.71       40.37                49         482        2.06       75.09
       9          187        0.80       41.17                50         544        2.33       77.42
      10          203        0.87       42.04                51         608        2.60       80.02
      11          193        0.83       42.86                52         712        3.04       83.06
      12          156        0.67       43.53                53         502        2.15       85.21
      13          158        0.68       44.20                54         522        2.23       87.44
      14          160        0.68       44.89                55         461        1.97       89.41
      15          150        0.64       45.53                56         528        2.26       91.67
      16          170        0.73       46.26                57         557        2.38       94.05
      17          153        0.65       46.91                58         449        1.92       95.97
      18          164        0.70       47.61                59         388        1.66       97.63
      19          158        0.68       48.29                60         282        1.21       98.83
      20          185        0.79       49.08                61         165        0.71       99.54
      21          201        0.86       49.94                62          44        0.19       99.73
      22          213        0.91       50.85                63          31        0.13       99.86
      23          198        0.85       51.69                64          10        0.04       99.90
      24          197        0.84       52.54                65           5        0.02       99.92
      25          176        0.75       53.29                66          16        0.07       99.99
      26          196        0.84       54.13                67           2        0.01      100.00
      27          181        0.77       54.90                68           0        0.0       100.00
      28          194        0.83       55.73                69           0        0.0       100.00
      29          211        0.90       56.63                70           0        0.0       100.00
      30          239        1.02       57.65                71           0        0.0       100.00
      31          246        1.05       58.71                72           0        0.0       100.00
      32          218        0.93       59.64                73           0        0.0       100.00
      33          225        0.96       60.60                74           0        0.0       100.00
      34          187        0.80       61.40                75           0        0.0       100.00
      35          154        0.66       62.06                76           0        0.0       100.00
      36          103        0.44       62.50                77           0        0.0       100.00
      37          118        0.50       63.00                78           0        0.0       100.00
      38           89        0.38       63.38                79           0        0.0       100.00
      39           95        0.41       63.79                80           0        0.0       100.00

                                         N        =  23391
                                         AVGE     =  24.56
                                         STD DEV  =  23.08
```

```
451969INTERNAT  2-S1      DELIVERY                INTERNAT  08356208        G63037
SHORT48101416080356208966251BEUFORT TRAS           GERALD    MC.63037047501761 75

 ST. LOUIS  VEH. NO. 49                         INITIAL SPEED VS. DELTA SPEED MATRIX
                                                          (N =  23370)

SPEED  -10   -9   -8   -7   -6   -5   -4   -3   -2   -1     0    1    2    3    4    5    6    7    8    9   10

    0    0    0    0    0    0    0    0    0    0    0  8093   50   15    2    1    0    0    0    0    0    0
    1    0    0    0    0    0    0    0    0    0   31    32   13   21   17    5    0    0    0    0    0    0
    2    0    0    0    0    0    0    0    0   28   20    37   29   17    6    6    1    0    0    0    0    0
    3    0    0    0    0    0    0    0    5   17   20    40   22   17   14    8    0    0    0    0    0    0
    4    0    0    0    0    0    0    1    8   21   20    66   25   23   11    4    2    0    0    0    0    0
    5    0    0    0    0    0    0    2   11   17   28    39   38   16    4    7    2    0    0    0    0    0
    6    0    0    0    0    0    0    7    7   17   36    59   27   27   10    6    0    0    0    0    0    0
    7    0    0    0    0    0    1    5    9   14   25    36   23   22   14    2    0    0    0    0    0    0
    8    0    0    0    0    1    0    9   14   15   34    40   24   18    7    2    0    0    0    0    0    1
    9    0    0    0    0    0    1    2   10   12   28    59   35   23   12    3    2    0    0    0    0    0
   10    0    0    0    0    0    1    7   10   14   22    72   37   22   14    4    0    0    0    0    0    0
   11    0    0    0    0    0    2    8   13   12   24    59   40   26    8    1    0    0    0    0    0    0
   12    0    0    0    0    0    2    6   11   12   25    38   37   19    6    0    0    0    0    0    0    0
   13    0    0    0    0    1    1    3   12   18   14    27   42   26   11    3    0    0    0    0    0    0
   14    0    0    0    0    2    2    4   15   17   16    33   44   17    4    5    0    0    0    0    0    0
   15    0    0    0    0    1    2    8   10   12   20    22   48   21    6    0    0    0    0    0    0    0
   16    0    0    0    0    0    1    5   14   12   24    47   41   20    5    1    0    0    0    0    0    0
   17    0    0    0    0    0    1    0   13   10   16    49   35   23    5    1    0    0    0    0    0    0
   18    0    0    0    0    0    3    7   10    8   15    58   34   23    5    1    0    0    0    0    0    0
   19    0    0    0    0    1    1    6   12   12   13    48   40   22    2    0    0    0    0    0    0    1
   20    0    0    0    0    1    2    6    9   10   25    56   49   23    2    1    0    0    0    0    0    0
   21    0    0    0    0    0    0    2   11   15   30    66   61   12    3    1    0    0    0    0    0    0
   22    0    0    0    0    0    1    3    9    8   32    74   74   11    1    0    0    0    0    0    0    0
   23    0    1    0    0    0    1    3   12   10   29    73   56   11    1    1    0    0    0    0    0    0
   24    0    0    0    0    0    1    2   10   11   24    74   68    7    0    0    0    0    0    0    0    0
   25    0    0    0    0    0    2    1    9    7   29    62   59    6    1    0    0    0    0    0    0    0
   26    0    0    0    0    0    1    2   11    8   21    83   64    6    0    0    0    0    0    0    0    0
   27    0    0    0    0    0    0    1    7    9   19    77   64    3    1    0    0    0    0    0    0    0
   28    0    0    0    0    0    1    2    7   11   24    85   60    3    1    0    0    0    0    0    0    0
   29    0    0    0    0    0    0    1    3    6   24   121   55    1    0    0    0    0    0    0    0    0
   30    0    0    0    0    0    1    1    6    9   24   152   43    2    1    0    0    0    0    0    0    0
   31    0    0    0    0    0    0    0    5    5   23   164   47    2    0    0    0    0    0    0    0    0
   32    0    0    0    0    0    0    0    2   10   29   134   41    2    0    0    0    0    0    0    0    0
   33    1    0    0    0    0    0    0    2    2   28   148   42    1    1    0    0    0    0    0    0    0
   34    0    0    0    0    0    0    1    0    5   26   116   37    2    0    0    0    0    0    0    0    0
   35    0    0    0    0    0    0    0    1    3   21   102   27    0    0    0    0    0    0    0    0    0
   36    0    0    0    0    0    0    0    0    3   10    64   22    4    0    0    0    0    0    0    0    0
   37    0    0    0    0    0    1    0    0    5   11    76   23    2    0    0    0    0    0    0    0    0
   38    0    0    0    0    0    0    1    0    2   12    51   21    2    0    0    0    0    0    0    0    0
   39    0    0    0    0    0    0    0    0    1   17    54   22    1    0    0    0    0    0    0    0    0
   40    0    0    0    0    0    0    0    1    1   13   102   23    2    0    0    0    0    0    0    0    0
   41    0    0    0    0    0    0    1    2    2   16   125   35    0    0    0    0    0    0    0    0    0
   42    0    0    0    0    0    0    0    0    2   22   127   36    2    0    0    0    0    0    0    0    0
   43    0    0    0    0    0    0    0    0    3   33   103   44    2    0    0    0    0    0    0    0    0
   44    0    0    0    0    0    0    0    1    1   31   160   52    1    0    0    0    0    0    0    0    0
   45    0    0    0    0    0    0    0    0    3   38   162   57    4    0    0    0    0    0    0    0    0
```

```
4S1969INTERNAT  2-S1      DELIVERY                 INTERNAT  08356208        G63037
SHORT481014160803562089662518EUFORT TRAS            GERALD    MC.630370475C176175

 ST. LOUIS  VEH. NO. 49                            INITIAL SPEED VS. DELTA SPEED MATRIX
                                                              (N =  23370)

SPEED  -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9

  46     0     0     0     0     0     0     0     0     0    42   161    45     2     0     0     0     0     0     0     0
  47     0     0     0     0     0     0     0     2     3    38   230    48     2     0     0     0     0     0     0     0
  48     0     0     0     0     0     0     0     0     1    38   279    60     4     0     0     0     0     0     0     0
  49     0     0     0     0     0     0     0     1     3    45   374    57     2     0     0     0     0     0     0     0
  50     0     0     0     0     0     0     0     1     3    54   419    66     1     0     0     0     0     0     0     0
  51     0     0     0     0     0     0     1     0     3    49   473    80     2     0     0     0     0     0     0     0
  52     0     0     0     0     0     0     0     0     3    69   556    84     0     0     0     0     0     0     0     0
  53     0     0     0     0     0     0     0     0     1    58   375    68     0     0     0     0     0     0     0     0
  54     0     0     0     0     0     0     0     0     1    42   402    72     5     0     0     0     0     0     0     0
  55     0     0     0     0     0     0     0     0     0    61   294   104     2     0     0     0     0     0     0     0
  56     0     0     0     0     0     0     0     0     3    76   381    67     1     0     0     0     0     0     0     0
  57     0     0     0     0     0     0     0     0     1    26   489    41     0     0     0     0     0     0     0     0
  58     0     0     0     0     0     0     0     0     0    30   330    39     0     0     0     0     0     0     0     0
  59     0     0     0     0     0     0     0     0     0    25   338    25     0     0     0     0     0     0     0     0
  60     0     0     0     0     0     0     0     0     0     9   260    13     0     0     0     0     0     0     0     0
  61     0     0     0     0     0     0     0     0     0     7   140    12     0     0     0     0     0     0     0     0
  62     0     0     0     0     0     0     0     0     0     5    33     6     0     0     0     0     0     0     0     0
  63     0     0     0     0     0     0     0     0     0     4    23     4     0     0     0     0     0     0     0     0
  64     0     0     0     0     0     0     0     0     0     2     7     0     1     0     0     0     0     0     0     0
  65     0     0     0     0     0     0     0     0     0     2     1     2     0     0     0     0     0     0     0     0
  66     0     0     0     0     0     0     0     0     0     2    12     2     0     0     0     0     0     0     0     0
  67     0     0     0     0     0     0     0     0     0     1     1     0     0     0     0     0     0     0     0     0
  68     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  69     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  70     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  71     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  72     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  73     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  74     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  75     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  76     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  77     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  78     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  79     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

TOTAL    1     1     0     0     7    29   108   296   442  1727 17199  2761   552   175    63     7     0     0     0     0

                              PERCENT OF TIME AT IDLE                  = 34.92

                              AVERAGE SPEED COMPUTED FROM MATRIX       = 24.61

                              AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.32

                              AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.58
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491969INTERNAT  2-S1      DELIVERY              INTERNAT  08356208        G63037
SHORT48101416080356208966251BEUFORT TRAS         GERALD    MC.6303704750176175

 ST. LOUIS  VEH. NO. 49                         INITIAL SPEED VS. DELTA SPEED MATRIX
                                                             (N =  23370)

 SPEED   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9    10

     0     0     0     0     0     0     0     0     0    28    51  8162    92    53    25    12     1     0     0     0     0     0
     5     0     0     0     0     0     1    15    40    86   129   240   135   105    53    27     4     0     0     0     0     0
    10     0     0     0     0     1     6    32    58    65   133   268   173   108    47    10     2     0     0     0     0     1
    15     0     0     0     0     4     7    20    64    69    90   178   210   107    31    10     0     0     0     0     0     0
    20     0     0     0     0     2     7    24    51    53   115   302   258    91    13     3     0     0     0     0     0     1
    25     0     1     0     0     0     5     9    49    45   122   369   311    33     3     1     0     0     0     0     0     0
    30     0     0     0     0     0     2     4    23    41   124   656   246    10     2     0     0     0     0     0     0     0
    35     1     0     0     0     0     1     1     3    18    96   506   151     9     1     0     0     0     0     0     0     0
    40     0     0     0     0     0     0     2     3     8    80   459   137     7     0     0     0     0     0     0     0     0
    45     0     0     0     0     0     0     0     3    10   182   816   246    11     0     0     0     0     0     0     0     0
    50     0     0     0     0     0     0     1     2    13   255  2101   347     9     0     0     0     0     0     0     0     0
    55     0     0     0     0     0     0     0     0     6   263  1941   352     8     0     0     0     0     0     0     0     0
    60     0     0     0     0     0     0     0     0     0    76  1157    95     0     0     0     0     0     0     0     0     0
    65     0     0     0     0     0     0     0     0     0    11    44     8     1     0     0     0     0     0     0     0     0
    70     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    75     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

 TOTAL     1     1     0     0     7    29   108   296   442  1727 17199  2761   552   175    63     7     0     0     0     0     2

                                      PERCENT OF TIME AT IDLE                  = 36.05

                                      AVERAGE SPEED COMPUTED FROM MATRIX       = 24.58

                                      AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.32

                                      AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.58
```

```
451969INTERNAT  2-S1      DELIVERY                      INTERNAT  08356208        G63037
SHORT481014160803562089662518EUFORT TRAS                 GERALD    MC.6303704750176175


ST. LOUIS  VEH. NO. 49                                   DISTRIBUTION OF ROLLING STOPS

       SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                        MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
       (UP TO)                                                             (UP TO)

          1         11        31.43       31.43                               1          0         0.0       100.00
          2          9        25.71       57.14                               2          0         0.0       100.00
          3          7        20.00       77.14                               3          0         0.0       100.00
          4          4        11.43       88.57                               4          0         0.0       100.00
          5          0         0.0        88.57                               5          0         0.0       100.00
          6          0         0.0        88.57                               6          0         0.0       100.00
          7          1         2.86       91.43                               7          0         0.0       100.00
          8          2         5.71       97.14                               8          0         0.0       100.00
          9          0         0.0        97.14                               9          0         0.0       100.00
         10          0         0.0        97.14                              10          0         0.0       100.00
         11          0         0.0        97.14                              11          0         0.0       100.00
         12          0         0.0        97.14                              12          0         0.0       100.00
         13          0         0.0        97.14                              13          0         0.0       100.00
         14          0         0.0        97.14                              14          0         0.0       100.00
         15          1         2.86      100.00                              15          0         0.0       100.00
         16          0         0.0       100.00                              20          0         0.0       100.00
         17          0         0.0       100.00                              25          0         0.0       100.00
         18          0         0.0       100.00                              30          0         0.0       100.00
         19          0         0.0       100.00                              35          0         0.0       100.00
         20          0         0.0       100.00                              40          0         0.0       100.00
         22          0         0.0       100.00                              45          0         0.0       100.00
         24          0         0.0       100.00                              50          0         0.0       100.00
         26          0         0.0       100.00                              55          0         0.0       100.00
         28          0         0.0       100.00                              60          0         0.0       100.00
         30          0         0.0       100.00
         32          0         0.0       100.00
         34          0         0.0       100.00
         36          0         0.0       100.00
         38          0         0.0       100.00
         40          0         0.0       100.00
         42          0         0.0       100.00
         44          0         0.0       100.00
         46          0         0.0       100.00
         48          0         0.0       100.00
         50          0         0.0       100.00
         52          0         0.0       100.00
         54          0         0.0       100.00
         56          0         0.0       100.00
         58          0         0.0       100.00

                                                NUMBER OF STOPS     =      35
                                                AVERAGE TIME/STOP   =    2.97   SECONDS
                                                TOTAL VEH. MILES    =  159.76
                                                AV. NO. STOPS/MILE  =    0.22
```

```
491969INTERNAT  2-S1       DELIVERY            INTERNAT  08356208         G63037
SHORT4810141608035620896625I8EUFORT TRAS         GERALD    MC.6303704750176175


ST. LOUIS  VEH. NO. 49                              DISTRIBUTION OF FULL STOPS

       SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
       (UP TO)                                                      (UP TO)

           1         12        19.67       19.67                       1          0         0.0         91.80
           2          1         1.64       21.31                       2          3         4.92        96.72
           3          5         8.20       29.51                       3          0         0.0         96.72
           4          2         3.28       32.79                       4          0         0.0         96.72
           5          0         0.0        32.79                       5          0         0.0         96.72
           6          1         1.64       34.43                       6          0         0.0         96.72
           7          3         4.92       39.34                       7          0         0.0         96.72
           8          2         3.28       42.62                       8          0         0.0         96.72
           9          1         1.64       44.26                       9          0         0.0         96.72
          10          0         0.0        44.26                      10          0         0.0         96.72
          11          3         4.92       49.18                      11          0         0.0         96.72
          12          5         8.20       57.38                      12          0         0.0         96.72
          13          0         0.0        57.38                      13          0         0.0         96.72
          14          1         1.64       59.02                      14          0         0.0         96.72
          15          2         3.28       62.30                      15          0         0.0         96.72
          16          1         1.64       63.93                      20          1         1.64        98.36
          17          1         1.64       65.57                      25          0         0.0         98.36
          18          1         1.64       67.21                      30          0         0.0         98.36
          19          1         1.64       68.85                      35          0         0.0         98.36
          20          0         0.0        68.85                      40          0         0.0         98.36
          22          0         0.0        68.85                      45          0         0.0         98.36
          24          0         0.0        68.85                      50          0         0.0         98.36
          26          2         3.28       72.13                      55          0         0.0         98.36
          28          2         3.28       75.41                      60          0         0.0         98.36
          30          0         0.0        75.41                      65          0         0.0         98.36
          32          2         3.28       78.69                      70          0          0          98.36
          34          1         1.64       80.33                      75          0         0.0         98.36
          36          1         1.64       81.97                      80          0         0.0         98.36
          38          1         1.64       83.61                      85          0         0.0         98.36
          40          0         0.0        83.61                      90          0         0.0         98.36
          42          0         0.0        83.61                      95          0         0.0         98.36
          44          2         3.28       86.89                     100          0         0.0         98.36
          46          2         3.28       90.16                     105          1         1.64       100.00
          48          0         0.0        90.16                     110          0         0.0        100.00
          50          0         0.0        90.16                     115          0         0.0        100.00
          52          1         1.64       91.80                     120          0         0.0        100.00
          54          0         0.0        91.80                     125          0         0.0        100.00
          56          0         0.0        91.80                     130          0         0.0        100.00
          58          0         0.0        91.80                     135          0         0.0        100.00

                                                  NUMBER OF STOPS     =      61
                                                  AVERAGE TIME/STOP   =  131.26   SECONDS
                                                  TOTAL VEH. MILES    =  159.76
                                                  AV. NO. STOPS/MILE  =    0.38
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491969INTERNAT  2-S1       DELIVERY.            INTERNAT  08356208        G63037
SHORT48101416080356208966251 3EUFORT TRAS          GERALD    MO.63037047501761 75


 ST. LOUIS  VEH. NO. 49                          DISTRIBUTION OF ENGINE-OFF STOPS

                                              MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
                                              (UP TO)

                                                 1          0          0.0          0.0
                                                 2          0          0.0          0.0
                                                 3          0          0.0          0.0
                                                 4          0          0.0          0.0
                                                 5          2         13.33        13.33
                                                 6          1          6.67        20.00
                                                 7          2         13.33        33.33
                                                 8          2         13.33        46.67
                                                 9          0          0.0         46.67
                                                10          1          6.67        53.33
                                                15          5         33.33        86.67
                                                20          1          6.67        93.33
                                                25          0          0.0         93.33
                                                30          1          6.67       100.00
                                                35          0          0.0        100.00
                                                40          0          0.0        100.00
                                                45          0          0.0        100.00
                                                50          0          0.0        100.00
                                                55          0          0.0        100.00
                                                60          0          0.0        100.00
                                                75          0          0.0        100.00
                                                90          0          0.0        100.00
                                               105          0          0.0        100.00
                                               120          0          0.0        100.00
                                               135          0          0.0        100.00
                                               150          0          0.0        100.00
                                               165          0          0.0        100.00
                                               180          0          0.0        100.00
                                               195          0          0.0        100.00
                                               210          0          0.0        100.00
                                               225          0          0.0        100.00
                                               240          0          0.0        100.00
                                               300          0          0.0        100.00
                                               360          0          0.0        100.00
                                               420          0          0.0        100.00
                                               480          0          0.0        100.00

                                                    NUMBER OF STOPS      =     15
                                                    AVERAGE TIME/STOP    =  10.62   MINUTES
                                                    TOTAL VEH. MILES     = 159.76
                                                    AV. NO. STOPS/MILE   =   0.09
```

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671969FORD       2          DELIVERY                 FORD      06F25BC61055     063136
LOCAL18                  470817G K POWERS  9290 W FLOST LOUIS   MO63136              90

 ST. LOUIS  VEH. NO. 67                          SPEED DENSITY AND DISTRIBUTION FUNCTIONS

      SPEED      FREQUENCY    DENSITY   DISTRIBUTION                     SPEED      FREQUENCY    DENSITY   DISTRIBUTION

       ZERO         1012       10.37                                      40          140         1.43       69.00
        0           1107       11.34       11.34                          41          114         1.17       70.17
        1            166        1.70       13.04                          42           84         0.86       71.03
        2            155        1.59       14.63                          43           87         0.89       71.92
        3            161        1.65       16.28                          44           75         0.77       72.69
        4            148        1.52       17.79                          45           63         0.65       73.34
        5            141        1.44       19.24                          46           70         0.72       74.05
        6            149        1.53       20.76                          47           71         0.73       74.78
        7            142        1.45       22.22                          48           75         0.77       75.55
        8            116        1.19       23.41                          49           69         0.71       76.25
        9            113        1.16       24.56                          50           78         0.80       77.05
       10            102        1.04       25.61                          51           67         0.69       77.74
       11            123        1.26       26.87                          52           73         0.75       78.49
       12            108        1.11       27.98                          53           54         0.55       79.04
       13             90        0.92       28.90                          54           85         0.87       79.91
       14            105        1.08       29.97                          55          134         1.37       81.28
       15            130        1.33       31.30                          56          211         2.16       83.45
       16            104        1.07       32.37                          57          264         2.70       86.15
       17            115        1.18       33.55                          58          303         3.10       89.25
       18            114        1.17       34.72                          59          408         4.18       93.43
       19            124        1.27       35.99                          60          285         2.92       96.35
       20            121        1.24       37.23                          61          186         1.91       98.26
       21            116        1.19       38.41                          62           50         0.51       98.77
       22            129        1.32       39.74                          63           48         0.49       99.26
       23            118        1.21       40.94                          64           37         0.38       99.64
       24            117        1.20       42.14                          65           17         0.17       99.82
       25            142        1.45       43.60                          66           16         0.16       99.98
       26            117        1.20       44.80                          67            2         0.02      100.00
       27            136        1.39       46.19                          68            0         0.0       100.00
       28            113        1.16       47.35                          69            0         0.0       100.00
       29            142        1.45       48.80                          70            0         0.0       100.00
       30            129        1.32       50.12                          71            0         0.0       100.00
       31            163        1.67       51.79                          72            0         0.0       100.00
       32            143        1.46       53.26                          73            0         0.0       100.00
       33            151        1.55       54.80                          74            0         0.0       100.00
       34            216        2.21       57.02                          75            0         0.0       100.00
       35            227        2.33       59.34                          76            0         0.0       100.00
       36            249        2.55       61.89                          77            0         0.0       100.00
       37            233        2.39       64.28                          78            0         0.0       100.00
       38            171        1.75       66.03                          79            0         0.0       100.00
       39            150        1.54       67.57                          80            0         0.0       100.00

                                                    N       =   9762
                                                    AVGE    =  29.43
                                                    STD DEV =  20.73
```

671969FORD 2 DELIVERY FORD 06F25HC61055 D63136
1708176 K POWERS 9290 W FLOST LOUIS MC63136 90
LOCAL18

INITIAL SPEED VS. DELTA SPEED MATRIX
(N = 9732)

ST. LOUIS VEH. NO. 67

SPEED	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0	1022	56	14	5	5	1	0	0	0	0
1	0	0	0	0	0	0	0	0	0	46	44	34	15	15	5	2	0	0	0	0
2	0	0	0	0	0	0	0	0	21	27	38	30	17	7	8	2	0	0	0	0
3	0	0	0	0	0	0	0	11	21	27	31	30	13	11	6	7	0	0	0	0
4	0	0	0	0	0	0	2	9	17	26	35	18	12	10	13	2	0	0	0	0
5	0	0	0	0	0	1	4	14	11	24	37	19	10	9	7	4	0	0	0	0
6	0	0	0	0	0	0	7	7	17	19	45	19	11	11	7	4	0	0	0	0
7	0	0	0	0	0	3	4	10	10	22	42	13	17	10	9	1	0	0	0	0
8	0	0	0	1	0	4	4	7	14	14	19	13	10	15	10	5	0	0	0	0
9	0	0	0	0	1	4	8	5	12	13	14	17	13	14	8	3	0	0	0	0
10	0	0	0	0	1	5	4	13	11	8	17	17	9	11	5	1	0	0	0	0
11	0	0	0	0	2	3	7	15	10	15	16	15	17	15	6	2	0	0	0	0
12	0	0	0	0	3	4	8	7	7	12	16	12	15	15	3	1	0	0	0	0
13	0	0	0	0	0	4	8	9	6	8	11	7	19	14	2	2	0	0	0	0
14	0	0	0	0	2	2	9	12	14	6	5	15	16	15	8	1	0	0	0	0
15	0	0	1	0	1	2	14	10	7	12	22	15	24	17	5	0	0	0	0	0
16	0	0	0	0	3	3	5	10	8	12	15	12	17	14	5	0	0	0	0	0
17	0	0	0	0	3	2	5	12	14	9	11	19	25	15	0	0	0	0	0	0
18	0	0	0	1	1	5	11	11	8	9	17	15	24	8	4	0	0	0	0	0
19	0	0	0	0	0	2	6	16	11	7	18	23	23	15	2	1	0	0	0	0
20	0	0	1	0	2	2	5	8	8	11	24	18	23	15	4	0	0	0	0	0
21	0	0	0	0	2	6	9	14	6	6	27	21	20	4	2	0	0	0	0	0
22	0	0	0	0	1	7	11	10	12	10	17	26	25	14	1	0	0	0	0	0
23	0	0	0	1	1	2	8	5	9	13	16	29	23	8	1	0	0	0	0	0
24	0	0	0	1	1	2	5	10	11	12	24	30	10	10	1	0	0	0	0	0
25	0	0	0	1	0	0	3	12	9	11	40	31	25	9	1	0	0	0	0	0
26	0	0	0	0	3	7	10	4	13	11	17	26	20	6	0	0	0	0	0	0
27	0	0	1	0	0	2	5	10	7	12	32	37	23	5	1	0	0	0	0	0
28	0	0	0	0	2	2	4	11	14	13	18	29	13	6	1	0	0	0	0	0
29	0	0	0	0	0	2	2	9	11	14	41	37	23	3	0	0	0	0	0	0
30	0	0	0	0	1	2	5	5	7	21	25	47	15	1	0	0	0	0	0	0
31	0	0	0	0	0	1	4	11	13	13	56	51	13	1	0	0	0	0	0	0
32	0	0	0	0	1	2	2	3	9	20	46	46	10	3	1	0	0	0	0	0
33	0	0	0	0	1	3	2	6	11	21	47	48	11	1	0	0	0	0	0	0
34	0	0	0	1	0	1	1	12	9	16	119	46	10	1	0	0	0	0	0	0
35	0	0	0	0	0	1	3	1	12	17	126	60	7	0	0	0	0	0	0	0
36	0	0	1	0	0	0	2	5	17	24	136	59	4	1	0	0	0	0	0	0
37	0	0	0	0	0	0	1	2	6	38	135	45	5	1	0	0	0	0	0	0
38	0	0	0	0	0	1	1	1	7	27	100	32	1	1	0	0	0	0	0	0
39	0	0	0	0	0	0	1	3	3	19	41	30	3	0	0	0	0	0	0	0
40	0	0	0	0	0	1	1	1	5	16	91	23	1	1	0	0	0	0	0	0
41	0	0	0	0	0	0	0	1	2	16	66	27	2	0	0	0	0	0	0	0
42	0	0	0	0	0	0	2	1	3	15	40	18	5	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	2	2	14	45	21	3	0	0	0	0	0	0	0
44	0	0	0	0	0	0	1	1	4	15	30	18	5	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	3	3	10	28	14	5	0	0	0	0	0	0	0

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671969FORD      2         DELIVERY                FORD      06F25BC61J55    D63136
LOCAL18                 A70817G K POWERS  9290 W FLOST LOUIS    M063136            90

 ST. LOUIS   VEH. NO. 67                         INITIAL SPEED VS. DELTA SPEED MATRIX
                                                              (N =    9732)

 SPEED   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9    10
    46     0     0     0     0     0     0     0     1     3    10    37    15     4     0     0     0     0     0     0     0     0
    47     0     0     0     0     0     0     1     1     0     9    38    19     2     1     0     0     0     0     0     0     0
    48     0     0     0     0     0     0     2     0     1    15    41    12     4     0     0     0     0     0     0     0     0
    49     0     0     0     0     0     0     0     2     1     6    43    14     3     0     0     0     0     0     0     0     0
    50     0     0     0     0     0     0     0     0     4    12    43    16     3     0     0     0     0     0     0     0     0
    51     0     0     0     0     0     0     1     0     2     9    37    15     3     0     0     0     0     0     0     0     0
    52     0     0     0     0     0     0     0     2     2    14    36    17     2     0     0     0     0     0     0     0     0
    53     0     0     0     0     0     0     0     1     1    12    19    21     0     0     0     0     0     0     0     0     0
    54     0     0     0     0     0     0     0     1     2    10    40    29     3     0     0     0     0     0     0     0     0
    55     0     0     0     0     0     0     0     1     1    23    71    38     0     0     0     0     0     0     0     0     0
    56     0     0     0     0     0     0     0     1     4    28   150    28     0     0     0     0     0     0     0     0     0
    57     0     0     0     0     0     0     0     0     0    13   214    36     1     0     0     0     0     0     0     0     0
    58     0     0     0     0     0     0     0     0     1    30   233    38     1     0     0     0     0     0     0     0     0
    59     0     0     0     0     0     0     0     1     0    17   376    14     0     0     0     0     0     0     0     0     0
    60     0     0     0     0     0     0     0     0     0     8   270     7     0     0     0     0     0     0     0     0     0
    61     0     0     0     0     0     0     0     0     1     8   163    14     0     0     0     0     0     0     0     0     0
    62     0     0     0     0     0     0     0     0     0     7    33    10     0     0     0     0     0     0     0     0     0
    63     0     0     0     0     0     0     0     0     0     7    34     7     0     0     0     0     0     0     0     0     0
    64     0     0     0     0     0     0     0     1     0     5    22     8     1     0     0     0     0     0     0     0     0
    65     0     0     0     0     0     0     0     0     0     5     9     3     0     0     0     0     0     0     0     0     0
    66     0     0     0     0     0     0     0     0     0     6     9     1     0     0     0     0     0     0     0     0     0
    67     0     0     0     0     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     0     0
    68     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    69     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    70     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    71     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    72     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    73     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    74     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    75     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    76     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    77     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    78     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    79     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

 TOTAL     0     0     4     6    32    83   197   341   455   985  4832  1630   653   339   136    39     0     0     0     0     0

                                      PERCENT OF TIME AT IDLE                       = 11.33

                                      AVERAGE SPEED COMPUTED FROM MATRIX            = 29.55

                                      AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.68

                                      AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -2.07
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```
671969FORD      2          DELIVERY                  FORD       C6F25BC61055     D63136
LOCAL18                 4708173 K POWERS  9290 W FLOST LOUIS    M063136              90

 ST. LOUIS  VEH. NO. 67                          INITIAL SPEED VS. DELTA SPEED MATRIX
                                                           (N =    9732)

 SPEED  -10   -9   -8   -7   -6   -5   -4   -3   -2   -1     0     1    2    3    4    5    6    7    8    9

    0     0    0    0    0    0    0    0    0   21   73  1104   120   46   27   18    5    0    0    0    0
    5     0    0    0    0    0    4   17   51   76  118   190    99   63   51   42   18    0    0    0    0
   10     0    0    0    1    7   20   31   47   54   62    82    74   64   70   37   12    0    0    0    0
   15     0    0    1    0    9   13   41   53   49   47    64    68  101   75   20    3    0    0    0    0
   20     0    0    1    1    6   17   41   59   45   43   103   103  115   56   13    1    0    0    0    0
   25     0    0    1    3    5   13   31   41   49   59   129   153  101   39    4    0    0    0    0    0
   30     0    0    0    0    4    9   17   39   54   81   186   210   74   14    2    0    0    0    0    0
   35     0    0    1    1    1    5    9   26   55  116   563   258   37    4    0    0    0    0    0    0
   40     0    0    0    0    0    2    5    7   20   93   388   130   12    2    0    0    0    0    0    0
   45     0    0    0    0    0    0    2    8   12   58   178    87   19    1    0    0    0    0    0    0
   50     0    0    0    0    0    0    3    4   10   56   200    74   15    0    0    0    0    0    0    0
   55     0    0    0    0    0    0    0    4    8   66   494   152    4    0    0    0    0    0    0    0
   60     0    0    0    0    0    0    0    1    2   70  1075    83    1    0    0    0    0    0    0    0
   65     0    0    0    0    0    0    0    1    0   23    76    19    1    0    0    0    0    0    0    0
   70     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
   75     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
   80     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0

 TOTAL    0    0    4    6   32   83  197  341  455  985  4832  1630  653  339  136   39    0    0    0    0

                                PERCENT OF TIME AT IDLE                        = 14.53

                                AVERAGE SPEED COMPUTED FROM MATRIX             = 29.52

                                AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.69

                                AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -2.09
```

```
671969FORD      2          DELIVERY             FORD      06F25BC61055    063136
LOCAL18                A70817G K POWERS  9290 W FLOST LOUIS   MO63136         90

                                                   DISTRIBUTION OF ROLLING STOPS
ST. LOUIS  VEH. NO. 67
                                                                     MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
     SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                    (UP TO)
     (UP TO)                                                                     0          0.0       100.00
                                                                        1        0          0.0       100.00
        1          9        21.43       21.43                           2        0          0.0       100.00
        2         10        23.81       45.24                           3        0          0.0       100.00
        3         13        30.95       76.19                           4        0          0.0       100.00
        4          4         9.52       85.71                           5        0          0.0       100.00
        5          3         7.14       92.86                           6        0          0.0       100.00
        6          2         4.76       97.62                           7        0          0.0       100.00
        7          1         2.38      100.00                           8        0          0.0       100.00
        8          0         0.0       100.00                           9        0          0.0       100.00
        9          0         0.0       100.00                          10        0          0.0       100.00
       10          0         0.0       100.00                          11        0          0.0       100.00
       11          0         0.0       100.00                          12        0          0.0       100.00
       12          0         0.0       100.00                          13        0          0.0       100.00
       13          0         0.0       100.00                          14        0          0.0       100.00
       14          0         0.0       100.00                          15        0          0.0       100.00
       15          0         0.0       100.00                          20        0          0.0       100.00
       16          0         0.0       100.00                          25        0          0.0       100.00
       17          0         0.0       100.00                          30        0          0.0       100.00
       18          0         0.0       100.00                          35        0          0.0       100.00
       19          0         0.0       100.00                          40        0          0.0       100.00
       20          0         0.0       100.00                          45        0          0.0       100.00
       22          0         0.0       100.00                          50        0          0.0       100.00
       24          0         0.0       100.00                          55        0          0.0       100.00
       26          0         0.0       100.00                          60
       28          0         0.0       100.00
       30          0         0.0       100.00
       32          0         0.0       100.00
       34          0         0.0       100.00
       36          0         0.0       100.00
       38          0         0.0       100.00
       40          0         0.0       100.00
       42          0         0.0       100.00
       44          0         0.0       100.00
       46          0         0.0       100.00
       48          0         0.0       100.00
       50          0         0.0       100.00
       52          0         0.0       100.00
       54          0         0.0       100.00
       56          0         0.0       100.00
       58          0         0.0       100.00

                                          NUMBER OF STOPS      =      42
                                          AVERAGE TIME/STOP    =    2.81   SECONDS
                                          TOTAL VEH. MILES     =   79.88
                                          AV. NO. STOPS/MILE   =    0.53
```

```
671969FORD       2         DELIVERY                  FORD      06F25BC61055    063136
LOCAL18                A70817G K POWERS  9290 W FLOST LOUIS   MO63136          90


 ST. LOUIS  VEH. NO. 67                              DISTRIBUTION OF FULL STOPS

        SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                      MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
        (UP TO)                                                           (UP TO)

            1          9       13.04       13.04                              1         0          0.0       100.00
            2          3        4.35       17.39                              2         0          0.0       100.00
            3          4        5.80       23.19                              3         0          0.0       100.00
            4          7       10.14       33.33                              4         0          0.0       100.00
            5          5        7.25       40.58                              5         0          0.0       100.00
            6          3        4.35       44.93                              6         0          0.0       100.00
            7          3        4.35       49.28                              7         0          0.0       100.00
            8          3        4.35       53.62                              8         0          0.0       100.00
            9          4        5.80       59.42                              9         0          0.0       100.00
           10          3        4.35       63.77                             10         0          0.0       100.00
           11          0        0.0        63.77                             11         0          0.0       100.00
           12          2        2.90       66.67                             12         0          0.0       100.00
           13          1        1.45       68.12                             13         0          0.0       100.00
           14          1        1.45       69.57                             14         0          0.0       100.00
           15          1        1.45       71.01                             15         0          0.0       100.00
           16          1        1.45       72.46                             20         0          0.0       100.00
           17          1        1.45       73.91                             25         0          0.0       100.00
           18          0        0.0        73.91                             30         0          0.0       100.00
           19          1        1.45       75.36                             35         0          0.0       100.00
           20          0        0.0        75.36                             40         0          0.0       100.00
           22          1        1.45       76.81                             45         0          0.0       100.00
           24          0        0.0        76.81                             50         0          0.0       100.00
           26          3        4.35       81.16                             55         0          0.0       100.00
           28          1        1.45       82.61                             60         0          0.0       100.00
           30          2        2.90       85.51                             65         0          0.0       100.00
           32          0        0.0        85.51                             70         0          0.0       100.00
           34          2        2.90       88.41                             75         0          0.0       100.00
           36          0        0.0        88.41                             80         0          0.0       100.00
           38          2        2.90       91.30                             85         0          0.0       100.00
           40          1        1.45       92.75                             90         0          0.0       100.00
           42          1        1.45       94.20                             95         0          0.0       100.00
           44          1        1.45       95.65                            100         0          0.0       100.00
           46          1        1.45       97.10                            105         0          0.0       100.00
           48          0        0.0        97.10                            110         0          0.0       100.00
           50          0        0.0        97.10                            115         0          0.0       100.00
           52          0        0.0        97.10                            120         0          0.0       100.00
           54          1        1.45       98.55                            125         0          0.0       100.00
           56          1        1.45      100.00                            130         0          0.0       100.00
           58          0        0.0       100.00                            135         0          0.0       100.00

                                               NUMBER OF STOPS      =     69
                                               AVERAGE TIME/STOP    =  13.46   SECONDS
                                               TOTAL VEH. MILES     =  79.88
                                               AV. NO. STOPS/MILE   =   0.86
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671969FORD      2        DELIVERY              FORD      06F258C61055    D63136
LOCAL18               A70817G K POWERS  9290 W FLOST LOUIS   M063136          90

 ST. LOUIS  VEH. NO. 67                      DISTRIBUTION OF ENGINE-OFF STOPS

                                    MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
                                    (UP TO)

                                        1         1         4.55        4.55
                                        2         3        13.64       18.18
                                        3         3        13.64       31.82
                                        4         2         9.09       40.91
                                        5         3        13.64       54.55
                                        6         2         9.09       63.64
                                        7         1         4.55       68.18
                                        8         1         4.55       72.73
                                        9         0         0.0        72.73
                                       10         1         4.55       77.27
                                       15         1         4.55       81.82
                                       20         1         4.55       86.36
                                       25         0         0.0        86.36
                                       30         1         4.55       90.91
                                       35         1         4.55       95.45
                                       40         0         0.0        95.45
                                       45         0         0.0        95.45
                                       50         0         0.0        95.45
                                       55         0         0.0        95.45
                                       60         0         0.0        95.45
                                       75         0         0.0        95.45
                                       90         0         0.0        95.45
                                      105         0         0.0        95.45
                                      120         1         4.55      100.00
                                      135         0         0.0       100.00
                                      150         0         0.0       100.00
                                      165         0         0.0       100.00
                                      180         0         0.0       100.00
                                      195         0         0.0       100.00
                                      210         0         0.0       100.00
                                      225         0         0.0       100.00
                                      240         0         0.0       100.00
                                      300         0         0.0       100.00
                                      360         0         0.0       100.00
                                      420         0         0.0       100.00
                                      480         0         0.0       100.00

                                        NUMBER OF STOPS     =      22
                                        AVERAGE TIME/STOP   =   11.98  MINUTES
                                        TOTAL VEH. MILES    =   79.88
                                        AV. NO. STOPS/MILE  =    0.28
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031972MACK       3-S2      CEMENT MIXER                         06        10C3114063043
LCCAL72132          11091393110GATEWAYREADY11930DCRSEMARYLANDHTMC 63043          0100

ST. LOUIS  VEH. NO.  3                          SPEED DENSITY AND DISTRIBUTION FUNCTIONS

      SPEED     FREQUENCY   DENSITY   DISTRIBUTION                      SPEED     FREQUENCY   DENSITY   DISTRIBUTION

                                                                          40         123        0.43       88.08
      ZERO        19294      66.87                                        41         117        0.41       88.49
        0         19333      67.00       67.00                            42         129        0.45       88.94
        1            64       0.22       67.22                            43         146        0.51       89.44
        2            64       0.22       67.45                            44         187        0.65       90.09
        3            90       0.31       67.76                            45         217        0.75       90.84
        4           118       0.41       68.17                            46         242        0.84       91.68
        5           131       0.45       68.62                            47         240        0.83       92.51
        6           162       0.56       69.18                            48         243        0.84       93.36
        7           161       0.56       69.74                            49         250        0.87       94.22
        8           131       0.45       70.19                            50         310        1.07       95.30
        9           108       0.37       70.57                            51         330        1.14       96.44
       10            81       0.28       70.85                            52         304        1.05       97.49
       11            98       0.34       71.19                            53         259        0.90       98.39
       12            97       0.34       71.53                            54         166        0.58       98.97
       13           131       0.45       71.98                            55         101        0.35       99.32
       14           121       0.42       72.40                            56          71        0.25       99.56
       15           139       0.48       72.88                            57          63        0.22       99.78
       16           157       0.54       73.42                            58          41        0.14       99.92
       17           131       0.45       73.88                            59          17        0.06       99.98
       18           151       0.52       74.40                            60           5        0.02      100.00
       19           203       0.70       75.11                            61           0        0.0       100.00
       20           204       0.71       75.81                            62           0        0.0       100.00
       21           154       0.53       76.35                            63           0        0.0       100.00
       22           208       0.72       77.07                            64           0        0.0       100.00
       23           198       0.69       77.75                            65           0        0.0       100.00
       24           216       0.75       78.50                            66           0        0.0       100.00
       25           221       0.77       79.27                            67           0        0.0       100.00
       26           198       0.69       79.95                            68           0        0.0       100.00
       27           220       0.76       80.72                            69           0        0.0       100.00
       28           225       0.78       81.50                            70           0        0.0       100.00
       29           218       0.76       82.25                            71           0        0.0       100.00
       30           198       0.69       82.94                            72           0        0.0       100.00
       31           148       0.51       83.45                            73           0        0.0       100.00
       32           119       0.41       83.86                            74           0        0.0       100.00
       33           144       0.50       84.36                            75           0        0.0       100.00
       34           180       0.62       84.99                            76           0        0.0       100.00
       35           185       0.64       85.63                            77           0        0.0       100.00
       36           158       0.55       86.18                            78           0        0.0       100.00
       37           141       0.49       86.66                            79           0        0.0       100.00
       38           138       0.48       87.14                            80           0        0.0       100.00
       39           149       0.52       87.66

                                                   N       =  28854
                                                   AVGE    =  10.50
                                                   STD DEV =  17.47
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031972MACK      3-S2      CEMENT MIXER                          06      1003114D63043
LOCAL72132        1109139311OGATEWAYREADY11930DCRSEMARYLANDHTMC 63043          0.00

ST. LOUIS  VEH. NO.  3                          INITIAL SPEED VS. DELTA SPEED MATRIX
                                                             (N =  28848)

SPEED   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9    10
    0     0     0     0     0     0     0     0     0     0     0 19297    22     9     0     0     1     0     2     0     0     2
    1     0     0     0     0     0     0     0     0     0    22    15    15    11     1     0     0     0     0     0     0     0
    2     0     0     0     0     0     0     0     0     8    14    14    12     6    10     0     0     0     0     0     0     0
    3     0     0     0     0     0     0     0     4     6    14    33    19    10     4     0     0     0     0     0     0     0
    4     0     0     0     0     0     0     0     3     7    17    52    27     8     4     0     0     0     0     0     0     0
    5     0     0     0     0     0     0     1     2    10    20    48    28    17     5     0     0     0     0     0     0     0
    6     0     0     0     0     0     0     1     6     7    20    81    33     9     4     0     0     0     0     0     0     0
    7     0     0     0     0     0     0     1     8     8    18    75    31    14     6     0     0     0     0     0     0     0
    8     0     0     0     0     0     1     2     5     3    16    63    21    10     9     1     0     0     0     0     0     0
    9     0     0     0     0     0     1     5     5     6    12    45    14    18     2     0     0     0     0     0     0     0
   10     0     0     0     0     0     2     2     4     6    14    24    17     6     6     0     0     0     0     0     0     0
   11     0     0     0     0     0     1     2     7     6    12    29    24    17     0     0     0     0     0     0     0     0
   12     0     0     0     0     0     1     2     1     6    11    35    32     6     2     1     0     0     0     0     0     0
   13     0     0     0     0     0     1     6     4    10    15    42    34    18     0     1     0     0     0     0     0     0
   14     0     0     0     0     0     2     1     6     4    14    52    35     6     1     0     0     0     0     0     0     0
   15     0     0     0     0     0     1     2     3    10    19    49    40    15     0     0     0     0     0     0     0     0
   16     0     0     0     0     0     1     1     6     5    22    72    37    12     0     1     0     0     0     0     0     0
   17     0     0     0     0     0     0     3     2     8    23    38    44    12     0     1     0     0     0     0     0     0
   18     0     0     0     0     0     2     1     3     8    19    67    45     5     0     0     0     0     0     0     0     0
   19     0     0     0     0     0     1     2     5    15    28    86    59     5     2     0     0     0     0     0     0     0
   20     0     0     0     0     0     1     2     4     4    25   106    55     6     0     0     0     0     0     0     0     0
   21     0     0     0     0     0     0     1     4    10    30    94    50     4     0     1     0     0     0     0     0     0
   22     0     0     0     0     0     0     1     3     7    30   104    53     9     1     0     0     0     0     0     0     0
   23     0     0     0     0     0     0     3     2     8    23    98    61     3     0     0     0     0     0     0     0     0
   24     0     0     0     0     0     0     0     1     7    38   106    57     6     0     0     0     0     0     0     0     0
   25     0     0     0     0     0     2     1     4     6    34   120    48     5     1     0     0     0     0     0     0     0
   26     0     0     0     0     0     0     0     2     5    29   100    55     7     0     0     0     0     0     0     0     0
   27     0     0     0     0     0     0     1     1     9    37   114    53     5     0     0     0     0     0     0     0     0
   28     0     0     0     0     0     0     0     1     2    40   134    42     6     0     0     0     0     0     0     0     0
   29     0     0     0     0     0     0     1     1     3    37   134    38     4     0     0     0     0     0     0     0     0
   30     0     0     0     0     0     1     0     1     1    29   119    43     4     0     0     0     0     0     0     0     0
   31     0     0     0     0     0     0     1     3     6    28    70    35     5     0     0     0     0     0     0     0     0
   32     0     0     0     0     0     0     0     1     6    28    44    36     4     0     0     0     0     0     0     0     0
   33     0     0     0     0     0     0     0     0     5    26    77    33     3     0     0     0     0     0     0     0     0
   34     0     0     0     0     0     0     0     1     3    32   103    39     2     0     0     0     0     0     0     0     0
   35     0     0     0     0     0     0     0     0     1    32   110    40     2     0     0     0     0     0     0     0     0
   36     0     0     0     0     0     0     0     0     1    30    89    37     0     0     0     0     0     0     0     0     0
   37     0     0     0     0     0     0     0     0     2    23    86    29     0     0     0     0     0     0     0     0     0
   38     0     0     0     0     0     0     0     0     1    26    81    30     0     0     0     0     0     0     0     0     0
   39     0     0     0     0     0     0     0     0     1    20   104    24     0     0     0     0     0     0     0     0     0
   40     0     0     0     0     0     0     0     0     1    17    80    25     0     0     0     0     0     0     0     0     0
   41     0     0     0     0     0     0     0     0     2    16    70    29     0     0     0     0     0     0     0     0     0
   42     0     0     0     0     0     0     0     1     0    24    74    29     1     0     0     0     0     0     0     0     0
   43     0     0     0     0     0     0     0     0     0    25    91    29     1     0     0     0     0     0     0     0     0
   44     0     0     0     0     0     0     0     0     1    27   116    47     0     0     0     0     0     0     0     0     0
   45     0     0     0     0     0     0     0     1     1    32   135    46     2     0     0     0     0     0     0     0     0
```

```
031972MACK      3-52     CEMENT MIXER                          06       1003114063043
LCCAL72132       11091393110GATEWAYREADY11930DORSEMARYLANDHTMC 63043              0100

                                                  INITIAL SPEED VS. DELTA SPEED MATRIX
ST. LOUIS  VEH. NO.  3                                        (N =  28844)

SPEED  -10   -9   -8   -7   -6   -5   -4   -3   -2   -1     0     1    2    3    4    5    6    7    8    9

  46     0    0    0    0    0    0    0    0    2   33   164    43    0    0    0    0    0    0    0    0
  47     0    0    0    0    0    0    0    0    1   34   163    40    2    0    0    0    0    0    0    0
  48     0    0    0    0    0    0    0    0    0   38   161    43    1    0    0    0    0    0    0    0
  49     0    0    0    0    0    0    0    0    0   32   174    44    0    0    0    0    0    0    0    0
  50     0    0    0    0    0    0    0    0    0   35   245    30    0    0    0    0    0    0    0    0
  51     0    0    0    0    0    0    0    0    0   28   264    38    0    0    0    0    0    0    0    0
  52     0    0    0    0    0    0    0    0    0   29   223    52    0    0    0    0    0    0    0    0
  53     0    0    0    0    0    0    0    0    1   35   181    42    0    0    0    0    0    0    0    0
  54     0    0    0    0    0    0    0    0    0   30   111    24    1    0    0    0    0    0    0    0
  55     0    0    0    0    0    0    0    0    0   14    62    25    0    0    0    0    0    0    0    0
  56     0    0    0    0    0    0    0    0    1   18    36    16    0    0    0    0    0    0    0    0
  57     0    0    0    0    0    0    0    0    0   17    37     8    1    0    0    0    0    0    0    0
  58     0    0    0    0    0    0    0    0    0    8    31     2    0    0    0    0    0    0    0    0
  59     0    0    0    0    0    0    0    0    0    1    14     2    0    0    0    0    0    0    0    0
  60     0    0    0    0    0    0    0    0    0    1     4     0    0    0    0    0    0    0    0    0
  61     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  62     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  63     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  64     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  65     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  66     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  67     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  68     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  69     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  70     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  71     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  72     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  73     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  74     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  75     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  76     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  77     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  78     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  79     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0
  80     0    0    0    0    0    0    0    0    0    0     0     0    0    0    0    0    0    0    0    0

TOTAL    0    0    0    0    0   18   43  105  231 1417 24636  2061  298   58    0    1    0    2    0    0

                                     PERCENT OF TIME AT IDLE                        = 67.02

                                     AVERAGE SPEED COMPUTED FROM MATRIX             = 10.51

                                     AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.19

                                     AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.35
```

```
031972MACK      3-S2      CEMENT MIXER                         06       1003114063043
LOCAL72132         1109139311CGATEWAYREADY11930DORSEMARYLANDHTMC 63043          0100

 ST. LOUIS  VEH. NO.  3                          INITIAL SPEED VS. DELTA SPEED MATRIX
                                                          (N =  28848)

 SPEED   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7     8     9    10
 *
     0     0     0     0     0     0     0     0     0     8    36 19326    49    26    11     0     1     0     2     0     0     2
     5     0     0     0     0     0     0     3    23    38    89   289   138    58    23     0     0     0     0     0     0     0
    10     0     0     0     0     0     6    13    22    27    65   196   108    57    19     2     0     0     0     0     0     0
    15     0     0     0     0     0     5    13    21    37    93   253   190    63     1     3     0     0     0     0     0     0
    20     0     0     0     0     0     4     7    19    44   132   417   262    29     3     1     0     0     0     0     0     0
    25     0     0     0     0     0     2     5    10    35   161   538   274    26     1     0     0     0     0     0     0     0
    30     0     0     0     0     0     1     2     7    18   162   501   194    23     0     0     0     0     0     0     0     0
    35     0     0     0     0     0     0     0     1    12   143   465   178     7     0     0     0     0     0     0     0     0
    40     0     0     0     0     0     0     0     1     5   103   409   137     1     0     0     0     0     0     0     0     0
    45     0     0     0     0     0     0     0     1     5   147   669   205     5     0     0     0     0     0     0     0     0
    50     0     0     0     0     0     0     0     0     0   162  1067   207     1     0     0     0     0     0     0     0     0
    55     0     0     0     0     0     0     0     0     2   114   427   115     2     0     0     0     0     0     0     0     0
    60     0     0     0     0     0     0     0     0     0    10    49     4     0     0     0     0     0     0     0     0     0
    65     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    70     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    75     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    80     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

 TOTAL     0     0     0     0     0    18    43   105   231  1417 24606  2061   298    58     6     1     0     2     0     0     2


                                   PERCENT OF TIME AT IDLE                = 67.46

                                   AVERAGE SPEED COMPUTED FROM MATRIX     = 10.52

                                   AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.19

                                   AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.35
```

```
031972MACK       3-S2       CEMENT MIXER                        06       1003114063043
LOCAL72132         11091393110GATEWAYREADY11930DORSEMARYLANDHTMO 63043          0100

                                               DISTRIBUTION OF ROLLING STOPS

ST. LOUIS   VEH. NO.  3                                                     MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
                                                                            (UP TO)
        SECONDS   FREQUENCY   DENSITY   DISTRIBUTION
        (UP TO)                                                                1          0          0.0       100.00
                                                                               2          0          0.0       100.00
           1          4        33.33       33.33                               3          0          0.0       100.00
           2          4        33.33       66.67                               4          0          0.0       100.00
           3          1         8.33       75.00                               5          0          0.0       100.00
           4          1         8.33       83.33                               6          0          0.0       100.00
           5          1         8.33       91.67                               7          0          0.0       100.00
           6          0         0.0        91.67                               8          0          0.0       100.00
           7          0         0.0        91.67                               9          0          0.0       100.00
           8          0         0.0        91.67                              10          0          0.0       100.00
           9          1         8.33      100.00                              11          0          0.0       100.00
          10          0         0.0       100.00                              12          0          0.0       100.00
          11          0         0.0       100.00                              13          0          0.0       100.00
          12          0         0.0       100.00                              14          0          0.0       100.00
          13          0         0.0       100.00                              15          0          0.0       100.00
          14          0         0.0       100.00                              20          0          0.0       100.00
          15          0         0.0       100.00                              25          0          0.0       100.00
          16          0         0.0       100.00                              30          0          0.0       100.00
          17          0         0.0       100.00                              35          0          0.0       100.00
          18          0         0.0       100.00                              40          0          0.0       100.00
          19          0         0.0       100.00                              45          0          0.0       100.00
          20          0         0.0       100.00                              50          0          0.0       100.00
          22          0         0.0       100.00                              55          0          0.0       100.00
          24          0         0.0       100.00                              60          0          0.0       100.00
          26          0         0.0       100.00
          28          0         0.0       100.00
          30          0         0.0       100.00
          32          0         0.0       100.00
          34          0         0.0       100.00
          36          0         0.0       100.00
          38          0         0.0       100.00
          40          0         0.0       100.00
          42          0         0.0       100.00
          44          0         0.0       100.00
          46          0         0.0       100.00
          48          0         0.0       100.00
          50          0         0.0       100.00
          52          0         0.0       100.00
          54          0         0.0       100.00
          56          0         0.0       100.00
          58          0         0.0       100.00

                                          NUMBER OF STOPS    =     12
                                          AVERAGE TIME/STOP  =   2.75   SECONDS
                                          TOTAL VEH. MILES   =  84.25
                                          AV. NO. STOPS/MILE =   0.14
```

```
031972MACK      3-S2     CEMENT MIXER                       06       1003114D63043
LOCAL72132        11091393110GATEWAYREADY11930DORSEMARYLANDHTMC 63043          0100


ST. LOUIS  VEH. NO.  3                                     DISTRIBUTION OF FULL STOPS

      SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                      MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
      (UP TO)                                                           (UP TO)

         1          3         8.57        8.57                             1          0         0.0        82.86
         2          0         0.0         8.57                             2          0         0.0        82.86
         3          2         5.71       14.29                             3          1         2.86       85.71
         4          1         2.86       17.14                             4          0         0.0        85.71
         5          1         2.86       20.00                             5          0         0.0        85.71
         6          1         2.86       22.86                             6          0         0.0        85.71
         7          3         8.57       31.43                             7          0         0.0        85.71
         8          3         8.57       40.00                             8          0         0.0        85.71
         9          1         2.86       42.86                             9          0         0.0        85.71
        10          0         0.0        42.86                            10          0         0.0        85.71
        11          1         2.86       45.71                            11          0         0.0        85.71
        12          1         2.86       48.57                            12          0         0.0        85.71
        13          0         0.0        48.57                            13          0         0.0        85.71
        14          1         2.86       51.43                            14          1         2.86       88.57
        15          1         2.86       54.29                            15          0         0.0        88.57
        16          2         5.71       60.00                            20          0         0.0        88.57
        17          1         2.86       62.86                            25          0         0.0        88.57
        18          1         2.86       65.71                            30          0         0.0        88.57
        19          0         0.0        65.71                            35          0         0.0        88.57
        20          0         0.0        65.71                            40          0         0.0        88.57
        22          2         5.71       71.43                            45          0         0.0        88.57
        24          2         5.71       77.14                            50          0         0.0        88.57
        26          1         2.86       80.00                            55          1         2.86       91.43
        28          0         0.0        80.00                            60          0         0.0        91.43
        30          0         0.0        80.00                            65          1         2.86       94.29
        32          0         0.0        80.00                            70          1         2.86       97.14
        34          0         0.0        80.00                            75          0         0.0        97.14
        36          0         0.0        80.00                            80          0         0.0        97.14
        38          1         2.86       82.86                            85          0         0.0        97.14
        40          0         0.0        82.86                            90          0         0.0        97.14
        42          0         0.0        82.86                            95          0         0.0        97.14
        44          0         0.0        82.86                           100          0         0.0        97.14
        46          0         0.0        82.86                           105          0         0.0        97.14
        48          0         0.0        82.86                           110          1         2.86      100.00
        50          0         0.0        82.86                           115          0         0.0       100.00
        52          0         0.0        82.86                           120          0         0.0       100.00
        54          0         0.0        82.86                           125          0         0.0       100.00
        56          0         0.0        82.86                           130          0         0.0       100.00
        58          0         0.0        82.86                           135          0         0.0       100.00

                                                    NUMBER OF STOPS      =     35
                                                    AVERAGE TIME/STOP    = 534.40   SECONDS
                                                    TOTAL VEH. MILES     =  84.25
                                                    AV. NO. STOPS/MILE   =   0.42
```

```
001972MACK      3-S2      CEMENT MIXER                          06      1003114063043
LOCAL72132       11091393110GATEWAYREADY11930DORSEMARYLANDHTMC 63043          0100


 ST. LOUIS  VEH. NO.  3                          DISTRIBUTION OF ENGINE-OFF STOPS

                                           MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
                                           (UP TO)

                                               1         0          0.0          0.0
                                               2         0          0.0          0.0
                                               3         0          0.0          0.0
                                               4         0          0.0          0.0
                                               5         0          0.0          0.0
                                               6         0          0.0          0.0
                                               7         0          0.0          0.0
                                               8         0          0.0          0.0
                                               9         0          0.0          0.0
                                              10         0          0.0          0.0
                                              15         0          0.0          0.0
                                              20         0          0.0          0.0
                                              25         0          0.0          0.0
                                              30         0          0.0          0.0
                                              35         0          0.0          0.0
                                              40         0          0.0          0.0
                                              45         0          0.0          0.0
                                              50         0          0.0          0.0
                                              55         1        100.00       100.00
                                              60         0          0.0        100.00
                                              75         0          0.0        100.00
                                              90         0          0.0        100.00
                                             105         0          0.0        100.00
                                             120         0          0.0        100.00
                                             135         0          0.0        100.00
                                             150         0          0.0        100.00
                                             165         0          0.0        100.00
                                             180         0          0.0        100.00
                                             195         0          0.0        100.00
                                             210         0          0.0        100.00
                                             225         0          0.0        100.00
                                             240         0          0.0        100.00
                                             300         0          0.0        100.00
                                             360         0          0.0        100.00
                                             420         0          0.0        100.00
                                             480         0          0.0        100.00

                                               NUMBER OF STOPS     =        1
                                               AVERAGE TIME/STOP  =   54.62  MINUTES
                                               TOTAL VEH. MILES    =   84.25
                                               AV. NO. STOPS/MILE =    0.01
```

```
021964GMC        8-2       BUS          BUS        GMC        08     PD41062841C63103
SHORT28                 466531CAPE-STLCUIS425GCODHCPCAPEGIRARDMC 63701        0405

ST. LOUIS  VEH. NO.  2                          SPEED DENSITY AND DISTRIBUTICN FUNCTICNS

      SPEED     FREQUENCY   DENSITY   DISTRIBUTICN                SPEED    FREQUENCY   DENSITY   DISTRIBUTION

      ZERO        3184       12.67                                 40         198        0.79      33.31
        0         3226       12.84      12.84                      41         265        1.05      34.36
        1           68        0.27      13.11                      42         311        1.24      35.60
        2           68        0.27      13.38                      43         383        1.52      37.12
        3           95        C.38      13.76                      44         327        1.30      38.43
        4          111        C.44      14.2C                      45         294        1.17      39.60
        5          123        C.49      14.69                      46         323        1.29      40.88
        6          132        0.53      15.21                      47         379        1.51      42.39
        7          137        C.55      15.76                      48         429        1.71      44.10
        8          108        0.43      16.19                      49         530        2.11      46.21
        9          102        C.41      16.59                      5C         581        2.31      48.52
       10          1C6        C.42      17.02                      51         634        2.52      51.04
       11          115        C.46      17.47                      52         668        2.66      53.70
       12           92        0.37      17.84                      53         671        2.67      56.37
       13           75        0.30      18.14                      54         607        2.42      58.78
       14           73        0.29      18.43                      55         738        2.94      61.72
       15           91        0.36      18.79                      56         895        3.56      65.28
       16           86        0.34      19.13                      57         989        3.94      69.22
       17           80        0.32      19.45                      58        1039        4.13      73.35
       18           84        0.33      19.79                      59         925        3.68      77.03
       19           91        0.36      20.15                      60         842        3.35      80.38
       20          113        C.45      20.6C                      61         8C3        3.20      83.58
       21           94        C.37      20.97                      62         698        2.78      86.36
       22           87        C.35      21.32                      63         576        2.29      88.65
       23          101        0.40      21.72                      64         561        2.23      90.88
       24          121        0.48      22.2C                      65         412        1.64      92.52
       25          112        C.45      22.65                      66         381        1.52      94.04
       26          117        C.47      23.11                      67         311        1.24      95.26
       27          116        0.46      23.57                      68         239        0.95      96.23
       28          149        C.59      24.17                      69         327        1.30      97.53
       29          127        C.51      24.67                      70         187        0.74      98.27
       30          131        0.52      25.19                      71         114        C.45      98.73
       31          155        0.62      25.81                      72          80        0.32      99.04
       32          165        C.66      26.47                      73          74        0.29      99.34
       33          244        C.97      27.44                      74          74        0.29      99.63
       34          203        0.81      28.25                      75          40        0.16      99.79
       35          224        0.89      29.14                      76          27        0.11      99.90
       36          230        C.92      30.C5                      77          18        0.07      99.97
       37          206        C.82      30.87                      78           7        C.03     100.00
       38          212        C.84      31.72                      79           C        0.0      100.00
       39          202        0.80      32.52                      8C           C        0.0      100.00

                                               N        =  25129
                                               AVGE     =  42.44
                                               STC DEV  =  22.40
```

021964GMC B-2 BUS BUS GMC 08 PD41062841063103
SHORT28 466531CAPE-STLOUIS425GOODHOPCAPEGIRARDMO 63701 0405

ST. LOUIS VEH. NO. 2

INITIAL SPEED VS. DELTA SPEED MATRIX
(N = 25102)

SPEED	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0	3182	24	9	1	2	1	1	0	0	1
1	0	0	0	0	0	0	0	0	0	17	14	17	9	9	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	8	15	18	11	7	6	2	1	0	0	0	0
3	0	0	0	0	0	0	0	7	16	11	20	19	11	7	3	1	0	0	0	0
4	0	0	0	0	0	0	0	3	12	17	33	16	16	7	4	2	0	0	0	0
5	0	0	0	0	0	1	1	8	14	23	31	26	10	8	1	0	0	0	0	0
6	0	0	0	0	1	0	1	10	12	24	34	24	11	8	5	2	0	0	0	0
7	0	0	0	1	0	0	2	4	22	21	41	21	9	10	3	2	1	0	0	0
8	0	0	1	0	0	0	1	5	13	22	28	15	12	3	8	0	0	0	0	0
9	0	0	0	0	1	0	1	7	16	27	13	11	11	10	1	4	0	0	0	0
10	0	0	0	0	1	1	4	5	10	17	21	17	14	8	3	5	0	0	0	0
11	0	0	0	0	1	1	3	3	19	29	28	9	12	6	3	0	1	0	0	0
12	0	0	0	0	0	2	2	6	9	20	16	14	10	9	3	1	0	0	0	0
13	0	0	0	0	0	0	4	3	13	11	15	7	12	9	0	1	0	0	0	0
14	0	0	0	0	0	0	7	7	15	10	8	11	4	7	3	0	1	0	0	0
15	0	0	0	0	0	2	3	7	7	18	14	12	10	9	6	2	0	0	0	0
16	0	0	0	1	0	0	5	6	14	13	16	10	12	7	2	0	0	0	0	0
17	0	0	0	0	0	2	2	6	8	12	20	13	10	5	1	1	0	0	0	0
18	0	0	0	0	0	1	2	6	13	13	18	14	11	5	1	0	0	0	0	0
19	0	0	0	0	0	2	4	4	13	8	19	20	11	8	2	0	0	0	0	0
20	0	0	0	0	0	0	4	5	12	13	40	20	8	8	3	0	0	0	0	0
21	0	0	0	0	0	0	1	3	6	15	26	26	11	5	0	0	0	0	0	0
22	0	0	0	0	1	1	1	7	9	15	9	29	9	4	1	0	0	0	0	0
23	0	0	0	0	0	1	5	5	11	17	22	18	12	8	0	0	0	0	0	0
24	0	0	0	0	0	0	4	5	13	9	45	33	9	3	0	0	0	0	0	0
25	0	0	0	0	0	1	0	3	12	17	39	17	17	6	0	0	0	0	0	0
26	0	0	0	1	0	0	3	6	8	23	34	24	16	2	0	0	0	0	0	0
27	0	0	0	0	0	1	5	4	6	21	36	24	14	5	0	0	0	0	0	0
28	0	0	0	0	1	2	4	3	5	26	51	32	23	2	0	0	0	0	0	0
29	0	0	0	0	0	0	0	4	12	24	46	24	16	1	0	0	0	0	0	0
30	0	0	0	0	0	1	1	3	1	35	41	30	15	4	0	0	0	0	0	0
31	0	0	0	0	0	1	2	4	12	29	50	46	11	0	0	0	0	0	0	0
32	0	0	0	0	0	0	4	1	6	35	58	48	12	1	0	0	0	0	0	0
33	0	0	0	0	0	3	1	2	7	35	116	63	14	2	0	0	0	0	0	0
34	0	0	0	0	0	0	2	3	6	42	80	61	8	0	0	0	0	0	0	0
35	0	0	0	0	0	0	1	4	10	32	94	73	10	0	0	0	0	0	0	0
36	0	0	0	0	1	2	0	3	8	34	97	73	11	0	0	0	0	0	0	0
37	0	0	0	0	0	0	1	4	10	46	66	72	7	0	0	0	0	0	0	0
38	0	0	0	0	0	3	0	6	5	38	89	60	11	0	0	0	0	0	0	0
39	0	0	0	0	0	2	0	1	7	42	81	60	9	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	4	8	40	77	57	10	0	0	0	0	0	0	0
41	0	0	0	0	0	2	0	4	5	42	129	77	6	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	1	8	50	166	79	7	0	0	0	0	0	0	0
43	0	0	0	1	0	1	0	5	9	50	235	78	4	0	0	0	0	0	0	0
44	0	0	0	0	1	0	2	2	6	50	159	97	9	1	0	0	0	0	0	0
45	0	0	0	0	0	0	1	1	9	56	132	88	7	0	0	0	0	0	0	0

```
021964GMC        8-2         BUS         BUS        GMC         08      PD41062841063103
SHORT28                   466531CAPE-STLOUIS425G00DHCPCAPEGIRARDMC 63701          0405

 ST. LOUIS  VEH. NO.  2                                INITIAL SPEED VS. DELTA SPEED MATRIX
                                                                  (N =  25102)

 SPEED   -10     -9     -8     -7     -6     -5     -4     -3     -2     -1      0      1      2      3      4      5      6      7      8      9     10

   46      0      0      0      0      0      1      1      1      7     75    147     85      3      2      0      0      0      0      0      0      0
   47      0      0      0      0      0      0      1      2     10     57    204     93     10      0      0      0      0      0      0      0      0
   48      0      0      0      0      0      0      0      1      5     64    247    104      6      0      0      0      0      0      0      0      0
   49      0      0      0      0      1      0      0      1     10     87    296    124     10      1      0      0      0      0      0      0      0
   50      0      0      0      0      0      1      0      1      8    100    337    129      5      0      0      0      0      0      0      0      0
   51      0      0      0      0      0      0      0      0      7    111    370    135     10      1      0      0      0      0      0      0      0
   52      0      0      0      0      1      0      0      1      6    106    382    158     14      0      0      0      0      0      0      0      0
   53      0      0      0      0      0      0      1      1      8    114    342    145      7      1      0      0      0      0      0      0      0
   54      0      0      0      0      0      1      1      0     10    119    326    140      9      1      0      0      0      0      0      0      0
   55      0      0      0      0      0      0      1      1      8    108    399    198     23      0      0      0      0      0      0      0      0
   56      0      0      0      0      0      0      0      0     13    137    489    247      8      1      0      0      0      0      0      0      0
   57      0      0      0      0      0      0      1      3     21    176    610    174      4      0      0      0      0      0      0      0      0
   58      0      0      0      0      0      0      0      2     13    121    753    143      5      0      0      0      0      0      0      0      0
   59      0      0      0      0      0      0      1      2      7    111    660    142      2      0      0      0      0      0      0      0      0
   60      0      0      0      0      0      0      0      2      6     93    614    120      5      0      0      0      0      0      0      0      0
   61      0      0      0      0      0      0      0      1      2     97    600     97      5      0      0      0      0      0      0      0      0
   62      0      0      0      0      0      0      0      0      5     71    498    117      7      0      0      0      0      0      0      0      0
   63      0      0      0      0      0      0      0      0      3     91    291    175     14      1      0      0      0      0      0      0      0
   64      0      0      0      0      0      0      0      1     14    148    267    129      2      0      0      0      0      0      0      0      0
   65      0      0      0      0      0      0      0      0     10     73    255     97      7      0      0      0      0      0      0      0      0
   66      0      0      0      0      0      0      0      0      3     55    200    114      9      0      0      0      0      0      0      0      0
   67      0      0      0      0      0      0      0      0      4     93    139     71      3      0      0      0      0      0      0      0      0
   68      0      0      0      0      0      0      0      0      5     60    142     32      0      0      0      0      0      0      0      0      0
   69      0      0      0      0      0      0      0      0      2     24    273     27      1      0      0      0      0      0      0      0      0
   70      0      0      0      0      0      0      0      0      0     27    133     26      1      0      0      0      0      0      0      0      0
   71      0      0      0      0      0      0      0      0      0     12     79     21      2      0      0      0      0      0      0      0      0
   72      0      0      0      0      0      0      0      0      1     18     46     14      1      0      0      0      0      0      0      0      0
   73      0      0      0      0      0      0      0      0      0      7     58      9      0      0      0      0      0      0      0      0      0
   74      0      0      0      0      0      0      0      0      1      9     52     12      0      0      0      0      0      0      0      0      0
   75      0      0      0      0      0      0      0      0      1      2     32      5      0      0      0      0      0      0      0      0      0
   76      0      0      0      0      0      0      0      0      0      5     20      2      0      0      0      0      0      0      0      0      0
   77      0      0      0      0      0      0      0      0      0      2     14      2      0      0      0      0      0      0      0      0      0
   78      0      0      0      0      0      0      0      0      0      1      5      1      0      0      0      0      0      0      0      0      0
   79      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
   80      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0

 TOTAL     0      0      1      4     10     36     91    210    635   3538  14937   4678    670    202     57     23      4      0      0      1      5

                                  PERCENT OF TIME AT IDLE                     = 12.85

                                  AVERAGE SPEED COMPUTED FROM MATRIX          = 42.49

                                  AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.25

                                  AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.34
```

```
021964GMC        B-2        BUS          BUS          GMC          08     P041062841D63103
SHORT28                466531CAPE-STLOUIS425GCODHCPCAPEGIRARCMO 63701              0405

 ST. LOUIS   VEH. NO.  2                                 INITIAL SPEED VS. DELTA SPEED MATRIX
                                                                   (N =  25102)

 SPEED   -10     -9     -8     -7     -6     -5     -4     -3     -2     -1      0      1      2      3      4      5      6      7      8      9

    0      0      0      0      0      0      0      0      0      8     32   3214     52     25     16      4      2      1      0      0      1
    5      0      0      0      1      1      1      4     32     76     96    159    106     57     40     16      7      1      0      0      0
   10      0      0      1      0      3      4     11     26     67    115    106     66     59     36     18     10      1      0      0      0
   15      0      0      0      1      0      4     21     29     57     64     73     53     48     37     12      4      1      0      0      0
   20      0      0      0      0      1      4     12     25     53     64    112    109     50     30      7      0      0      0      0      0
   25      0      0      0      1      0      3     17     23     50     87    176    116     68     24      0      0      0      0      0      0
   30      0      0      0      0      1      4     11     15     36    149    246    180     77      8      0      0      0      0      0      0
   35      0      0      0      0      1      5      5     16     41    189    453    342     50      2      0      0      0      0      0      0
   40      0      0      0      0      0      7      0     16     33    212    542    333     43      0      0      0      0      0      0      0
   45      0      0      0      1      1      2      5     11     41    288    877    441     33      3      0      0      0      0      0      0
   50      0      0      0      0      2      1      0      4     36    468   1632    650     45      2      0      0      0      0      0      0
   55      0      0      0      0      0      1      4      5     60    654   2216    904     51      3      0      0      0      0      0      0
   60      0      0      0      0      0      0      1      7     33    493   3125    619     24      0      0      0      0      0      0      0
   65      0      0      0      0      0      0      0      1     34    460   1152    556     35      1      0      0      0      0      0      0
   70      0      0      0      0      0      0      0      0      8    141    673    120      5      0      0      0      0      0      0      0
   75      0      0      0      0      0      0      0      0      2     25    176     30      0      0      0      0      0      0      0      0
   80      0      0      0      0      0      0      0      0      0      1      5      1      0      0      0      0      0      0      0      0

 TOTAL     0      0      1      4     10     36     91    210    635   3538  14937   4678    670    202     57     23      4      0      0      1


                                                PERCENT OF TIME AT IDLE                  = 13.39

                                                AVERAGE SPEED COMPUTED FROM MATRIX       = 42.49

                                                AVERAGE DELTA SPEED FOR POSITIVE VALUES =  1.25

                                                AVERAGE DELTA SPEED FOR NEGATIVE VALUES = -1.34
```

```
021964GMC       B-2       BUS          BUS        GMC        08    PD41062841063103
SHORT28                466531CAPE-STLOUIS425GCODHCPCAPEGIRARDMO 63701          0405


 ST. LOUIS  VEH. NO.  2                              DISTRIBUTION OF ROLLING STOPS

 *      SECONDS   FREQUENCY   DENSITY   DISTRIBUTION                 MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
        (UP TO)                                                      (UP TO)

           1          7        25.00       25.00                         1          0         0.0        100.00
           2         10        35.71       60.71                         2          0         0.0        100.00
           3          6        21.43       82.14                         3          0         0.0        100.00
           4          1         3.57       85.71                         4          0         0.0        100.00
           5          2         7.14       92.86                         5          0         0.0        100.00
           6          1         3.57       96.43                         6          0         0.0        100.00
           7          1         3.57      100.00                         7          0         0.0        100.00
           8          0         0.0       100.00                         8          0         0.0        100.00
           9          0         0.0       100.00                         9          0         0.0        100.00
          10          0         0.0       100.00                        10          0         0.0        100.00
          11          0         0.0       100.00                        11          0         0.0        100.00
          12          0         0.0       100.00                        12          0         0.0        100.00
          13          0         0.0       100.00                        13          0         0.0        100.00
          14          0         0.0       100.00                        14          0         0.0        100.00
          15          0         0.0       100.00                        15          0         0.0        100.00
          16          0         0.0       100.00                        20          0         0.0        100.00
          17          0         0.0       100.00                        25          0         0.0        100.00
          18          0         0.0       100.00                        30          0         0.0        100.00
          19          0         0.0       100.00                        35          0         0.0        100.00
          20          0         0.0       100.00                        40          0         0.0        100.00
          22          0         0.0       100.00                        45          0         0.0        100.00
          24          0         0.0       100.00                        50          0         0.0        100.00
          26          0         0.0       100.00                        55          0         0.0        100.00
          28          0         0.0       100.00                        60          0         0.0        100.00
          30          0         0.0       100.00
          32          0         0.0       100.00
          34          0         0.0       100.00
          36          0         0.0       100.00
          38          0         0.0       100.00
          40          0         0.0       100.00
          42          0         0.0       100.00
          44          0         0.0       100.00
          46          0         0.0       100.00
          48          0         0.0       100.00
          50          0         0.0       100.00
          52          0         0.0       100.00
          54          0         0.0       100.00
          56          0         0.0       100.00
          58          0         0.0       100.00

                                           NUMBER OF STOPS     =      28
                                           AVERAGE TIME/STOP   =    2.57   SECONDS
                                           TOTAL VEH. MILES    =  296.26
                                           AV. NO. STOPS/MILE  =    0.09
```

```
021964GMC       B-2        BUS          BUS          GMC          08    PD41062841063103
SHORT28              466531CAPE-STLOUIS425000DHCPCAPEGIRAPDMO 63701                 0405


 ST. LOUIS  VEH. NO.  2
                                                          DISTRIBUTION OF FULL STOPS
      SECONDS    FREQUENCY    DENSITY    DISTRIBUTION
      (UP TO)                                                          MINUTES    FREQUENCY    DENSITY    DISTRIBUTION
                                                                       (UP TO)
         1           2          5.00         5.00
         2           2          5.00        10.00                         1           0          0.0         62.50
         3           3          7.50        17.50                         2           6         15.00        77.50
         4           2          5.00        22.50                         3           2          5.00        82.50
         5           1          2.50        25.00                         4           3          7.50        90.00
         6           0          0.0         25.00                         5           1          2.50        92.50
         7           1          2.50        27.50                         6           2          5.00        97.50
         8           0          0.0         27.50                         7           0          0.0         97.50
         9           0          0.0         27.50                         8           1          2.50       100.00
        10           3          7.50        35.00                         9           0          0.0        100.00
        11           0          0.0         35.00                        10           0          0.0        100.00
        12           0          0.0         35.00                        11           0          0.0        100.00
        13           0          0.0         35.00                        12           0          0.0        100.00
        14           0          0.0         35.00                        13           0          0.0        100.00
        15           1          2.50        37.50                        14           0          0.0        100.00
        16           0          0.0         37.50                        15           0          0.0        100.00
        17           0          0.0         37.50                        20           0          0.0        100.00
        18           1          2.50        40.00                        25           0          0.0        100.00
        19           1          2.50        42.50                        30           0          0.0        100.00
        20           2          5.00        47.50                        35           0          0.0        100.00
        22           1          2.50        50.00                        40           0          0.0        100.00
        24           0          0.0         50.00                        45           0          0.0        100.00
        26           0          0.0         50.00                        50           0          0.0        100.00
        28           0          0.0         50.00                        55           0          0.0        100.00
        30           1          2.50        52.50                        60           0          0.0        100.00
        32           0          0.0         52.50                        65           0          0.0        100.00
        34           0          0.0         52.50                        70           0          0.0        100.00
        36           0          0.0         52.50                        75           0          0.0        100.00
        38           1          2.50        55.00                        80           0          0.0        100.00
        40           0          0.0         55.00                        85           0          0.0        100.00
        42           0          0.0         55.00                        90           0          0.0        100.00
        44           1          2.50        57.50                        95           0          0.0        100.00
        46           1          2.50        60.00                       100           0          0.0        100.00
        48           0          0.0         60.00                       105           0          0.0        100.00
        50           1          2.50        62.50                       110           0          0.0        100.00
        52           0          0.0         62.50                       115           0          0.0        100.00
        54           0          0.0         62.50                       120           0          0.0        100.00
        56           0          0.0         62.50                       125           0          0.0        100.00
        58           0          0.0         62.50                       130           0          0.0        100.00
                                                                        135           0          0.0        100.00

                                           NUMBER OF STOPS      =     40
                                           AVERAGE TIME/STOP    =  74.50   SECONDS
                                           TOTAL VEH. MILES     = 296.26
                                           AV. NO. STOPS/MILE   =   0.14
```

```
021964GMC       B-2      BUS         BUS        GMC       08   PD41062841D63103
SHORT28              466531CAPE-STLOUIS425GCODHCPCAPEGIRARDMC 63701        0405


 ST. LOUIS  VEH. NO.  2                         DISTRIBUTION OF ENGINE-OFF STOPS

                                        MINUTES   FREQUENCY   DENSITY   DISTRIBUTION
                                        (UP TO)

                                            1         0         0.0         0.0
                                            2         0         0.0         0.0
                                            3         0         0.0         0.0
                                            4         0         0.0         0.0
                                            5         0         0.0         0.0
                                            6         0         0.0         0.0
                                            7         0         0.0         0.0
                                            8         0         0.0         0.0
                                            9         0         0.0         0.0
                                           10         0         0.0         0.0
                                           15         0         0.0         0.0
                                           20         0         0.0         0.0
                                           25         0         0.0         0.0
                                           30         0         0.0         0.0
                                           35         0         0.0         0.0
                                           40         0         0.0         0.0
                                           45         0         0.0         0.0
                                           50         0         0.0         0.0
                                           55         0         0.0         0.0
                                           60         0         0.0         0.0
                                           75         0         0.0         0.0
                                           90         0         0.0         0.0
                                          105         0         0.0         0.0
                                          120         0         0.0         0.0
                                          135         0         0.0         0.0
                                          150         0         0.0         0.0
                                          165         0         0.0         0.0
                                          180         0         0.0         0.0
                                          195         0         0.0         0.0
                                          210         0         0.0         0.0
                                          225         0         0.0         0.0
                                          240         0         0.0         0.0
                                          300         0         0.0         0.0
                                          360         0         0.0         0.0
                                          420         0         0.0         0.0
                                          480         0         0.0         0.0

                                            NUMBER OF STOPS    =       0
                                            AVERAGE TIME/STOP  =    0.0   MINUTES
                                            TOTAL VEH. MILES   = 296.26
                                            AV. NO. STOPS/MILE =    0.0
```

Appendix B

INITIAL-SPEED/DELTA-SPEED AND TRANSITION-PROBABILITY MATRICES USED TO GENERATE CYCLES

This appendix contains the cycle-generation matrices for the following categories:

All St. Louis Trucks, Freeway
All St. Louis Trucks, Nonfreeway
St. Louis Transit Buses, Nonfreeway
St. Louis Express Buses, Freeway

TABLE B-1. INITIAL SPEED VS DELTA SPEED: ALL ST. LOUIS TRUCKS, FREEWAY

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
0	0	0	0	0	2347	46	8	2	2	2405
1	0	0	0	40	50	31	12	11	2	146
2	0	0	17	31	53	22	11	6	3	143
3	0	4	14	28	58	27	9	4	5	149
4	2	6	11	29	42	34	10	11	4	149
5	1	10	18	32	87	36	8	7	3	202
6	6	10	15	21	86	37	17	4	4	200
7	3	9	18	22	117	36	20	6	4	235
8	2	10	15	25	106	30	11	6	4	209
9	11	12	17	28	58	34	18	3	5	186
10	7	8	8	27	48	35	11	8	1	153
11	10	8	11	27	44	38	13	4	2	157
12	9	12	11	22	55	43	17	7	1	177
13	18	10	18	30	64	48	20	5	4	217
14	8	7	14	33	65	44	14	6	2	193
15	8	12	23	33	53	50	20	7	1	207
16	13	13	17	30	58	47	23	7	4	212
17	15	11	22	22	59	48	19	6	1	203
18	17	8	18	25	61	41	17	7	4	198
19	14	12	23	32	55	43	25	4	2	210
20	12	14	19	40	53	45	20	7	2	212
21	10	10	26	32	60	58	22	5	2	225
22	17	16	16	41	93	59	17	7	1	267
23	15	10	26	47	106	77	18	3	3	305
24	19	19	22	55	125	95	23	5	1	364
25	11	12	28	44	154	92	29	3	1	374
26	13	19	25	53	125	107	20	5	0	367
27	17	20	26	60	179	107	30	8	0	447
28	25	14	30	78	236	134	27	2	0	546
29	15	17	28	87	222	131	22	5	3	530
30	16	18	30	91	293	171	29	2	0	650
31	11	26	23	103	321	166	28	5	0	683
32	14	11	37	125	314	178	33	5	1	718
33	10	27	29	133	384	188	35	7	0	813
34	15	18	32	170	477	222	40	2	0	976
35	10	13	42	167	560	275	32	4	0	1103
36	11	18	43	184	644	256	38	3	1	1198
37	7	13	43	218	827	311	29	4	0	1452
38	10	15	41	224	949	331	31	3	0	1604
39	11	14	43	257	1072	369	31	1	0	1798
40	9	15	41	292	1329	419	28	4	1	2138

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TABLE B-1. INITIAL SPEED VS DELTA SPEED: ALL ST. LOUIS TRUCKS, FREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
41	10	16	49	310	1453	504	28	0	0	2370
42	8	11	44	386	1692	540	38	2	0	2721
43	7	14	53	394	2171	613	43	3	0	3298
44	4	14	44	467	2289	861	40	2	0	3721
45	4	8	68	663	2496	887	41	1	0	4168
46	4	11	55	661	3172	827	36	2	0	4768
47	4	10	60	626	4108	994	29	2	0	5833
48	5	5	42	792	5096	1112	36	0	0	7088
49	1	10	51	784	6000	1000	22	1	0	7869
50	2	6	35	749	6723	992	20	0	0	8527
51	1	2	40	734	6999	1243	31	0	0	9050
52	2	2	36	984	7388	1663	20	0	0	10095
53	1	5	38	1169	8294	1358	15	0	0	10880
54	2	7	29	945	9330	1988	47	1	0	12349
55	0	5	31	1714	8383	3474	30	0	0	13637
56	1	3	80	2556	9116	2131	6	0	0	13893
57	1	3	38	1198	11147	1193	9	0	0	13589
58	1	1	20	908	10936	1490	5	0	0	13361
59	1	2	15	925	11506	977	4	0	0	13430
60	0	3	7	553	11554	694	1	0	0	12812
61	1	1	5	464	10063	770	3	0	0	11307
62	0	1	2	649	6889	1921	13	0	0	9475
63	1	2	10	1418	5082	1603	1	0	0	8117
64	0	2	8	929	4391	526	8	0	0	5864
65	0	1	0	336	2818	774	16	0	0	3945
66	0	0	5	581	1242	584	10	0	0	2422
67	2	0	10	452	825	187	0	0	0	1476
68	0	0	5	87	754	48	0	0	0	894
69	0	0	3	31	543	32	0	0	0	609
70	0	0	1	10	284	12	0	0	0	307
71	0	0	0	5	90	3	0	0	0	98
72	0	0	0	1	10	4	0	0	0	15
73	0	0	0	3	26	3	0	0	0	32
74	0	0	0	1	39	2	0	0	0	42
75	0	0	0	1	2	1	0	0	0	4
76	0	0	0	1	3	1	0	0	0	5
77	0	0	0	1	3	1	0	0	0	5
78	0	0	0	1	7	0	0	0	0	8
79	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
TOTALS	485	646	1824	25527	175013	35574	1437	225	74	240805

TABLE B-2. TRANSITION PROBABILITY MATRIX: ALL ST. LOUIS TRUCKS, FREEWAY

	-4	-3	-2	-1	0	1	2	3	4
0	0.0	0.0	0.0	0.0	0.9759	0.9950	0.9983	0.9992	1.0000
1	0.0	0.0	0.0	0.2740	0.6164	0.8288	0.9110	0.9863	1.0000
2	0.0	0.0	0.1189	0.3357	0.7063	0.8601	0.9371	0.9790	1.0000
3	0.0	0.0268	0.1208	0.3087	0.6980	0.8792	0.9396	0.9664	1.0000
4	0.0134	0.0537	0.1275	0.3221	0.6040	0.8322	0.8993	0.9732	1.0000
5	0.0050	0.0545	0.1436	0.3020	0.7327	0.9109	0.9505	0.9851	1.0000
6	0.0300	0.0800	0.1550	0.2600	0.6900	0.8750	0.9600	0.9800	1.0000
7	0.0128	0.0511	0.1277	0.2213	0.7191	0.8723	0.9574	0.9830	1.0000
8	0.0096	0.0574	0.1292	0.2488	0.7560	0.8995	0.9522	0.9809	1.0000
9	0.0591	0.1237	0.2151	0.3656	0.6774	0.8602	0.9570	0.9731	1.0000
10	0.0458	0.0980	0.1503	0.3268	0.6405	0.8693	0.9412	0.9935	1.0000
11	0.0637	0.1146	0.1847	0.3567	0.6369	0.8790	0.9618	0.9873	1.0000
12	0.0508	0.1186	0.1808	0.3051	0.6158	0.8588	0.9548	0.9944	1.0000
13	0.0829	0.1290	0.2120	0.3502	0.6452	0.8664	0.9585	0.9816	1.0000
14	0.0415	0.0777	0.1503	0.3212	0.6580	0.8860	0.9585	0.9896	1.0000
15	0.0386	0.0966	0.2077	0.3671	0.6232	0.8647	0.9614	0.9952	1.0000
16	0.0613	0.1226	0.2028	0.3443	0.6179	0.8396	0.9481	0.9811	1.0000
17	0.0739	0.1281	0.2365	0.3448	0.6355	0.8719	0.9655	0.9951	1.0000
18	0.0859	0.1263	0.2172	0.3434	0.6515	0.8586	0.9444	0.9798	1.0000
19	0.0667	0.1238	0.2333	0.3857	0.6476	0.8524	0.9714	0.9905	1.0000
20	0.0566	0.1226	0.2123	0.4009	0.6509	0.8632	0.9575	0.9906	1.0000
21	0.0444	0.0889	0.2044	0.3467	0.6133	0.8711	0.9689	0.9911	1.0000
22	0.0637	0.1236	0.1835	0.3371	0.6854	0.9064	0.9700	0.9963	1.0000
23	0.0492	0.0820	0.1672	0.3213	0.6689	0.9213	0.9803	0.9902	1.0000
24	0.0522	0.1044	0.1648	0.3155	0.6593	0.9203	0.9835	0.9973	1.0000
25	0.0294	0.0615	0.1364	0.2540	0.6658	0.9118	0.9893	0.9973	1.0000
26	0.0354	0.0872	0.1553	0.2997	0.6403	0.9319	0.9864	1.0000	1.0000
27	0.0380	0.0828	0.1409	0.2752	0.6756	0.9150	0.9821	1.0000	1.0000
28	0.0458	0.0714	0.1264	0.2692	0.7015	0.9469	0.9963	1.0000	1.0000
29	0.0283	0.0604	0.1132	0.2774	0.6962	0.9434	0.9849	0.9943	1.0000
30	0.0246	0.0523	0.0985	0.2385	0.6892	0.9523	0.9969	1.0000	1.0000
31	0.0161	0.0542	0.0878	0.2387	0.7086	0.9517	0.9927	1.0000	1.0000
32	0.0195	0.0348	0.0864	0.2604	0.6978	0.9457	0.9916	0.9986	1.0000
33	0.0123	0.0455	0.0812	0.2448	0.7171	0.9483	0.9914	1.0000	1.0000
34	0.0154	0.0338	0.0666	0.2408	0.7295	0.9570	0.9980	1.0000	1.0000
35	0.0091	0.0209	0.0589	0.2103	0.7180	0.9674	0.9964	1.0000	1.0000
36	0.0092	0.0242	0.0601	0.2137	0.7513	0.9649	0.9967	0.9992	1.0000
37	0.0048	0.0138	0.0434	0.1935	0.7631	0.9773	0.9972	1.0000	1.0000
38	0.0062	0.0156	0.0411	0.1808	0.7724	0.9788	0.9981	1.0000	1.0000
39	0.0061	0.0139	0.0378	0.1808	0.7770	0.9822	0.9994	1.0000	1.0000
40	0.0042	0.0112	0.0304	0.1670	0.7886	0.9846	0.9977	0.9995	1.0000

TABLE B-2. TRANSITION PROBABILITY MATRIX: ALL ST. LOUIS TRUCKS, FREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4
41	0.0042	0.0110	0.0316	0.1624	0.7755	0.9882	1.0000	1.0000	1.0000
42	0.0029	0.0070	0.0232	0.1650	0.7868	0.9853	0.9993	1.0000	1.0000
43	0.0021	0.0064	0.0224	0.1419	0.8002	0.9861	0.9991	1.0000	1.0000
44	0.0011	0.0048	0.0167	0.1422	0.7573	0.9887	0.9995	1.0000	1.0000
45	0.0010	0.0029	0.0192	0.1783	0.7771	0.9899	0.9998	1.0000	1.0000
46	0.0008	0.0031	0.0147	0.1533	0.8186	0.9920	0.9996	1.0000	1.0000
47	0.0007	0.0024	0.0127	0.1200	0.8243	0.9947	0.9997	1.0000	1.0000
48	0.0007	0.0014	0.0073	0.1191	0.8380	0.9949	1.0000	1.0000	1.0000
49	0.0001	0.0014	0.0079	0.1075	0.8700	0.9971	0.9999	1.0000	1.0000
50	0.0002	0.0009	0.0050	0.0929	0.8813	0.9977	1.0000	1.0000	1.0000
51	0.0001	0.0003	0.0048	0.0859	0.8592	0.9966	1.0000	1.0000	1.0000
52	0.0002	0.0004	0.0040	0.1014	0.8333	0.9980	1.0000	1.0000	1.0000
53	0.0001	0.0006	0.0040	0.1115	0.8738	0.9986	1.0000	1.0000	1.0000
54	0.0002	0.0007	0.0031	0.0756	0.8351	0.9961	0.9999	1.0000	1.0000
55	0.0	0.0004	0.0026	0.1283	0.7431	0.9978	1.0000	1.0000	1.0000
56	0.0001	0.0003	0.0060	0.1900	0.8462	0.9996	1.0000	1.0000	1.0000
57	0.0001	0.0003	0.0031	0.0913	0.9115	0.9993	1.0000	1.0000	1.0000
58	0.0001	0.0001	0.0016	0.0696	0.8881	0.9996	1.0000	1.0000	1.0000
59	0.0001	0.0002	0.0013	0.0702	0.9270	0.9997	1.0000	1.0000	1.0000
60	0.0	0.0002	0.0008	0.0439	0.9458	0.9999	1.0000	1.0000	1.0000
61	0.0001	0.0002	0.0006	0.0417	0.9316	0.9997	1.0000	1.0000	1.0000
62	0.0	0.0001	0.0003	0.0688	0.7959	0.9986	1.0000	1.0000	1.0000
63	0.0001	0.0004	0.0016	0.1763	0.8024	0.9999	1.0000	1.0000	1.0000
64	0.0	0.0003	0.0017	0.1601	0.9089	0.9986	1.0000	1.0000	1.0000
65	0.0	0.0003	0.0003	0.0854	0.7997	0.9959	1.0000	1.0000	1.0000
66	0.0	0.0	0.0021	0.2415	0.7547	0.9959	1.0000	1.0000	1.0000
67	0.0014	0.0014	0.0081	0.3144	0.8733	1.0000	1.0000	1.0000	1.0000
68	0.0	0.0	0.0056	0.1029	0.9463	1.0000	1.0000	1.0000	1.0000
69	0.0	0.0	0.0049	0.0558	0.9475	1.0000	1.0000	1.0000	1.0000
70	0.0	0.0	0.0033	0.0358	0.9609	1.0000	1.0000	1.0000	1.0000
71	0.0	0.0	0.0	0.0510	0.9694	1.0000	1.0000	1.0000	1.0000
72	0.0	0.0	0.0	0.0667	0.7333	1.0000	1.0000	1.0000	1.0000
73	0.0	0.0	0.0	0.0938	0.9063	1.0000	1.0000	1.0000	1.0000
74	0.0	0.0	0.0	0.0238	0.9524	1.0000	1.0000	1.0000	1.0000
75	0.0	0.0	0.0	0.2500	0.7500	1.0000	1.0000	1.0000	1.0000
76	0.0	0.0	0.0	0.2000	0.8000	1.0000	1.0000	1.0000	1.0000
77	0.0	0.0	0.0	0.2000	0.8000	1.0000	1.0000	1.0000	1.0000
78	0.0	0.0	0.0	0.1250	1.0000	1.0000	1.0000	1.0000	1.0000
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE B-3. INITIAL SPEED VS DELTA SPEED: ALL ST. LOUIS TRUCKS, NONFREEWAY

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
0	0	0	0	0	168269	1730	610	124	55	170788
1	0	0	0	1791	2172	1062	616	482	70	6193
2	0	0	730	1180	1307	824	523	481	156	5201
3	0	277	690	1038	1522	862	488	415	172	5464
4	87	275	687	1061	1798	921	603	420	186	6038
5	107	285	620	1114	2219	1103	715	397	167	6727
6	162	334	636	1234	2331	1212	861	414	176	7360
7	224	383	589	1216	2056	1122	870	459	154	7073
8	240	388	606	1137	1870	1146	846	443	173	6849
9	272	366	639	1037	1519	1171	842	447	163	6456
10	306	388	635	1018	1721	1227	818	449	159	6721
11	354	382	562	1013	1636	1317	864	427	131	6686
12	332	367	577	938	1540	1339	879	379	135	6486
13	335	390	607	854	1620	1422	920	414	107	6669
14	292	429	640	837	1589	1425	895	352	126	6585
15	326	423	601	869	1573	1451	933	313	86	6575
16	312	404	585	860	1655	1502	914	349	90	6671
17	288	427	607	868	1757	1565	910	265	53	6740
18	292	405	591	874	1923	1639	829	271	49	6873
19	265	420	576	920	2120	1795	767	284	51	7198
20	259	337	577	1041	2309	1886	750	218	41	7418
21	244	341	529	1105	2602	1901	668	199	40	7629
22	196	331	494	1178	2816	2041	628	187	27	7898
23	192	331	469	1168	3177	2172	562	135	23	8229
24	169	262	458	1229	3346	2195	477	111	18	8265
25	147	270	456	1201	3754	2231	472	95	17	8643
26	153	225	397	1235	4044	2341	424	82	17	8918
27	110	192	391	1314	3954	2260	352	64	9	8646
28	115	184	354	1295	4491	2118	308	51	6	8922
29	82	153	330	1267	4579	2064	268	38	10	8791
30	87	123	276	1230	4379	2042	241	35	13	8426
31	70	120	266	1201	4576	1911	207	27	2	8380
32	59	68	212	1197	4666	1813	156	19	3	8193
33	46	85	228	1112	4286	1783	156	32	5	7733
34	38	72	172	1125	3966	1690	135	25	3	7226
35	34	46	169	1064	4005	1416	100	10	1	6845
36	35	41	136	954	3739	1351	95	9	2	6362
37	23	45	115	890	3443	1259	77	12	4	5868
38	12	24	104	846	3359	1076	64	6	0	5491
39	17	24	96	718	3269	941	62	6	0	5133
40	19	18	82	660	3008	845	49	12	0	4693

TABLE B-3. INITIAL SPEED VS DELTA SPEED: ALL ST. LOUIS TRUCKS, NONFREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
41	9	12	75	592	2569	791	46	5	0	4099
42	6	13	57	507	2484	712	49	5	0	3833
43	8	15	54	492	2496	662	40	9	0	3776
44	5	9	35	480	1947	762	56	4	0	3298
45	2	10	49	549	1991	647	40	3	0	3291
46	7	9	38	443	1965	454	38	3	0	2957
47	3	7	27	303	1786	465	38	2	0	2631
48	4	2	22	310	1816	407	31	0	0	2592
49	3	9	21	257	1654	326	23	2	0	2295
50	1	5	19	208	1675	306	16	0	0	2230
51	2	1	17	208	1408	274	18	2	0	1930
52	0	5	16	182	938	264	14	1	0	1420
53	0	1	8	184	715	187	9	0	0	1104
54	0	5	12	123	574	189	10	2	0	915
55	0	2	8	136	376	159	9	0	0	690
56	0	0	12	108	268	107	1	0	0	496
57	0	1	5	62	303	68	4	0	0	443
58	0	1	2	51	253	47	3	0	0	357
59	0	0	1	31	176	24	0	0	0	232
60	0	1	0	14	75	18	1	0	0	109
61	0	0	0	10	74	9	0	0	0	93
62	0	0	0	10	37	14	1	0	0	62
63	0	0	0	5	46	3	0	0	0	54
64	0	0	0	7	28	8	0	0	0	43
65	0	0	0	2	21	7	0	0	0	30
66	0	0	0	5	36	2	0	0	0	43
67	0	0	0	2	15	0	0	0	0	17
68	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
TOTALS	6351	9743	17967	48170	305691	70083	22401	8996	2700	492102

TABLE B-4. TRANSITION PROBABILITY MATRIX: ALL ST. LOUIS TRUCKS, NONFREEWAY

	-4	-3	-2	-1	0	1	2	3	4
0	0.0	0.0	0.0	0.0	0.9853	0.9954	0.9990	0.9997	1.0000
1	0.0	0.0	0.0	0.2892	0.6399	0.8114	0.9109	0.9887	1.0000
2	0.0	0.0	0.1404	0.3672	0.6185	0.7770	0.8775	0.9700	1.0000
3	0.0	0.0507	0.1770	0.3669	0.6455	0.8033	0.8926	0.9685	1.0000
4	0.0144	0.0600	0.1737	0.3495	0.6472	0.7998	0.8996	0.9692	1.0000
5	0.0159	0.0583	0.1504	0.3160	0.6459	0.8099	0.9162	0.9752	1.0000
6	0.0220	0.0674	0.1538	0.3215	0.6382	0.8029	0.9198	0.9761	1.0000
7	0.0317	0.0858	0.1691	0.3410	0.6317	0.7903	0.9133	0.9782	1.0000
8	0.0350	0.0917	0.1802	0.3462	0.6192	0.7865	0.9101	0.9747	1.0000
9	0.0421	0.0988	0.1978	0.3584	0.5937	0.7751	0.9055	0.9748	1.0000
10	0.0455	0.1033	0.1977	0.3492	0.6053	0.7878	0.9095	0.9763	1.0000
11	0.0529	0.1101	0.1941	0.3456	0.5903	0.7873	0.9165	0.9804	1.0000
12	0.0512	0.1078	0.1967	0.3414	0.5788	0.7852	0.9208	0.9792	1.0000
13	0.0502	0.1087	0.1997	0.3278	0.5707	0.7839	0.9219	0.9840	1.0000
14	0.0443	0.1095	0.2067	0.3338	0.5751	0.7915	0.9274	0.9809	1.0000
15	0.0496	0.1139	0.2053	0.3375	0.5767	0.7974	0.9393	0.9869	1.0000
16	0.0468	0.1073	0.1950	0.3239	0.5720	0.7972	0.9342	0.9865	1.0000
17	0.0427	0.1061	0.1961	0.3249	0.5856	0.8178	0.9528	0.9921	1.0000
18	0.0425	0.1014	0.1874	0.3146	0.5944	0.8328	0.9534	0.9929	1.0000
19	0.0368	0.0952	0.1752	0.3030	0.5975	0.8469	0.9535	0.9929	1.0000
20	0.0349	0.0803	0.1581	0.2985	0.6097	0.8640	0.9651	0.9945	1.0000
21	0.0320	0.0767	0.1460	0.2909	0.6319	0.8811	0.9687	0.9948	1.0000
22	0.0248	0.0667	0.1293	0.2784	0.6350	0.8934	0.9729	0.9966	1.0000
23	0.0233	0.0636	0.1205	0.2625	0.6486	0.9125	0.9808	0.9972	1.0000
24	0.0204	0.0521	0.1076	0.2563	0.6611	0.9267	0.9844	0.9978	1.0000
25	0.0170	0.0482	0.1010	0.2400	0.6743	0.9324	0.9870	0.9980	1.0000
26	0.0172	0.0424	0.0869	0.2254	0.6789	0.9414	0.9889	0.9981	1.0000
27	0.0127	0.0349	0.0802	0.2321	0.6895	0.9508	0.9916	0.9990	1.0000
28	0.0129	0.0335	0.0732	0.2183	0.7217	0.9591	0.9936	0.9993	1.0000
29	0.0093	0.0267	0.0643	0.2084	0.7293	0.9641	0.9945	0.9989	1.0000
30	0.0103	0.0249	0.0577	0.2037	0.7234	0.9657	0.9943	0.9985	1.0000
31	0.0084	0.0227	0.0544	0.1977	0.7438	0.9718	0.9965	0.9998	1.0000
32	0.0072	0.0155	0.0414	0.1875	0.7570	0.9783	0.9973	0.9996	1.0000
33	0.0059	0.0169	0.0464	0.1902	0.7445	0.9750	0.9952	0.9994	1.0000
34	0.0053	0.0152	0.0390	0.1947	0.7436	0.9774	0.9961	0.9996	1.0000
35	0.0050	0.0117	0.0364	0.1918	0.7769	0.9838	0.9984	0.9999	1.0000
36	0.0055	0.0119	0.0333	0.1833	0.7710	0.9833	0.9983	0.9997	1.0000
37	0.0039	0.0116	0.0312	0.1829	0.7696	0.9842	0.9973	0.9993	1.0000
38	0.0022	0.0066	0.0255	0.1796	0.7913	0.9873	0.9989	1.0000	1.0000
39	0.0033	0.0080	0.0267	0.1666	0.8034	0.9868	0.9988	1.0000	1.0000
40	0.0040	0.0079	0.0254	0.1660	0.8069	0.9870	0.9974	1.0000	1.0000

TABLE B-4. TRANSITION PROBABILITY MATRIX: ALL ST. LOUIS TRUCKS, NONFREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4
41	0.0022	0.0051	0.0234	0.1678	0.7946	0.9876	0.9988	1.0000	1.0000
42	0.0016	0.0050	0.0198	0.1521	0.8002	0.9859	0.9987	1.0000	1.0000
43	0.0021	0.0061	0.0204	0.1507	0.8117	0.9870	0.9976	1.0000	1.0000
44	0.0015	0.0042	0.0149	0.1604	0.7508	0.9818	0.9988	1.0000	1.0000
45	0.0006	0.0036	0.0185	0.1854	0.7903	0.9869	0.9991	1.0000	1.0000
46	0.0024	0.0054	0.0183	0.1681	0.8326	0.9861	0.9990	1.0000	1.0000
47	0.0011	0.0038	0.0141	0.1292	0.8081	0.9848	0.9992	1.0000	1.0000
48	0.0015	0.0023	0.0108	0.1304	0.8310	0.9880	1.0000	1.0000	1.0000
49	0.0013	0.0052	0.0144	0.1264	0.8471	0.9891	0.9991	1.0000	1.0000
50	0.0004	0.0027	0.0112	0.1045	0.8556	0.9928	1.0000	1.0000	1.0000
51	0.0010	0.0016	0.0104	0.1181	0.8477	0.9896	0.9990	1.0000	1.0000
52	0.0	0.0035	0.0148	0.1430	0.8035	0.9894	0.9993	1.0000	1.0000
53	0.0	0.0009	0.0082	0.1748	0.8225	0.9918	1.0000	1.0000	1.0000
54	0.0	0.0055	0.0186	0.1530	0.7803	0.9869	0.9978	1.0000	1.0000
55	0.0	0.0029	0.0145	0.2116	0.7565	0.9870	1.0000	1.0000	1.0000
56	0.0	0.0	0.0242	0.2419	0.7823	0.9980	1.0000	1.0000	1.0000
57	0.0	0.0023	0.0135	0.1535	0.8375	0.9910	1.0000	1.0000	1.0000
58	0.0	0.0028	0.0084	0.1513	0.8599	0.9916	1.0000	1.0000	1.0000
59	0.0	0.0	0.0043	0.1379	0.8966	1.0000	1.0000	1.0000	1.0000
60	0.0	0.0092	0.0092	0.1376	0.8257	0.9908	1.0000	1.0000	1.0000
61	0.0	0.0	0.0	0.1075	0.9032	1.0000	1.0000	1.0000	1.0000
62	0.0	0.0	0.0	0.1613	0.7581	0.9839	1.0000	1.0000	1.0000
63	0.0	0.0	0.0	0.0926	0.9444	1.0000	1.0000	1.0000	1.0000
64	0.0	0.0	0.0	0.1628	0.8140	1.0000	1.0000	1.0000	1.0000
65	0.0	0.0	0.0	0.0667	0.7667	1.0000	1.0000	1.0000	1.0000
66	0.0	0.0	0.0	0.1163	0.9535	1.0000	1.0000	1.0000	1.0000
67	0.0	0.0	0.0	0.1176	1.0000	1.0000	1.0000	1.0000	1.0000
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE B-5. INITIAL SPEED VS DELTA SPEED: ST. LOUIS TRANSIT BUSES, NONFREEWAY

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
0	0	0	0	0	10743	300	128	54	120	11345
1	0	0	0	205	142	107	129	87	0	670
2	0	0	130	92	90	72	64	98	7	553
3	0	58	76	68	70	58	64	134	14	542
4	51	67	71	54	55	51	86	90	23	548
5	49	66	52	58	67	70	89	86	19	556
6	58	44	63	66	107	81	118	106	20	663
7	51	64	58	80	79	70	117	97	24	640
8	78	60	58	77	74	57	102	94	30	630
9	75	56	74	60	70	67	94	99	28	623
10	58	56	53	65	61	67	96	99	20	575
11	52	60	71	47	73	76	82	82	23	566
12	75	57	73	42	79	89	101	80	15	611
13	73	54	59	59	71	82	123	71	19	611
14	55	68	60	64	64	65	112	50	18	556
15	45	82	54	44	109	92	126	50	9	611
16	42	63	68	56	101	113	110	57	9	619
17	54	64	66	69	89	113	121	36	8	620
18	40	61	66	60	110	128	116	41	9	631
19	39	67	64	77	118	137	113	39	2	656
20	18	58	78	90	170	151	95	24	2	686
21	27	57	60	100	203	168	89	26	3	733
22	27	55	52	89	206	173	75	13	3	693
23	17	46	57	89	184	177	54	14	0	638
24	18	37	57	82	196	184	53	8	0	635
25	15	33	55	93	223	167	57	5	1	649
26	13	29	36	99	225	188	44	5	0	639
27	13	14	41	111	284	181	23	0	0	667
28	9	15	29	76	245	150	21	0	0	545
29	8	19	25	68	286	137	13	1	0	557
30	6	11	21	45	235	126	6	0	0	450
31	6	11	19	54	185	84	8	0	0	367
32	1	4	12	34	130	76	3	0	0	260
33	3	9	14	26	76	55	9	1	0	193
34	1	4	8	30	75	48	4	0	0	170
35	0	5	6	31	66	45	3	0	0	156
36	1	3	10	27	88	39	3	0	0	171
37	0	1	4	29	79	30	5	0	0	148
38	0	0	3	21	52	20	2	0	0	98
39	0	0	4	13	35	18	2	0	0	72
40	0	0	1	16	22	11	1	0	0	51

TABLE B-5. INITIAL SPEED VS DELTA SPEED: ST. LOUIS TRANSIT BUSES, NONFREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
41	0	0	0	9	9	12	2	0	0	32
42	0	1	1	9	23	5	1	1	0	41
43	0	0	2	6	8	5	1	0	0	22
44	0	0	2	2	13	2	1	0	0	20
45	0	0	1	2	4	1	2	0	0	10
46	0	0	0	4	2	1	0	0	0	7
47	0	0	0	0	3	1	1	0	0	5
48	0	0	1	1	1	0	0	0	0	3
49	0	0	0	1	2	0	0	0	0	3
50	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
TOTALS	1078	1459	1815	2600	15702	4150	2669	1648	426	31547

TABLE B-6. TRANSITION PROBABILITY MATRIX: ST. LOUIS TRANSIT BUSES, NONFREEWAY

	-4	-3	-2	-1	0	1	2	3	4
0	0.0	0.0	0.0	0.0	0.9469	0.9734	0.9847	0.9894	1.0000
1	0.0	0.0	0.0	0.3060	0.5179	0.6776	0.8701	1.0000	1.0000
2	0.0	0.0	0.2351	0.4014	0.5642	0.6944	0.8101	0.9873	1.0000
3	0.0	0.1070	0.2472	0.3727	0.5018	0.6089	0.7269	0.9742	1.0000
4	0.0931	0.2153	0.3449	0.4434	0.5438	0.6369	0.7938	0.9580	1.0000
5	0.0881	0.2068	0.3004	0.4047	0.5252	0.6511	0.8112	0.9658	1.0000
6	0.0875	0.1538	0.2489	0.3484	0.5098	0.6320	0.8100	0.9698	1.0000
7	0.0797	0.1797	0.2703	0.3953	0.5187	0.6281	0.8109	0.9625	1.0000
8	0.1238	0.2190	0.3111	0.4333	0.5508	0.6413	0.8032	0.9524	1.0000
9	0.1204	0.2103	0.3291	0.4254	0.5377	0.6453	0.7961	0.9551	1.0000
10	0.1009	0.1983	0.2904	0.4035	0.5096	0.6261	0.7930	0.9652	1.0000
11	0.0919	0.1979	0.3233	0.4064	0.5353	0.6696	0.8145	0.9594	1.0000
12	0.1227	0.2160	0.3355	0.4043	0.5336	0.6792	0.8445	0.9755	1.0000
13	0.1195	0.2079	0.3044	0.4010	0.5172	0.6514	0.8527	0.9689	1.0000
14	0.0989	0.2212	0.3291	0.4442	0.5594	0.6763	0.8777	0.9676	1.0000
15	0.0736	0.2079	0.2962	0.3682	0.5466	0.6972	0.9034	0.9853	1.0000
16	0.0679	0.1656	0.2795	0.3700	0.5331	0.7157	0.8934	0.9855	1.0000
17	0.0871	0.1903	0.2968	0.4081	0.5516	0.7339	0.9290	0.9871	1.0000
18	0.0634	0.1601	0.2647	0.3597	0.5341	0.7369	0.9208	0.9857	1.0000
19	0.0595	0.1616	0.2591	0.3765	0.5564	0.7652	0.9375	0.9970	1.0000
20	0.0262	0.1108	0.2245	0.3557	0.6035	0.8236	0.9621	0.9971	1.0000
21	0.0368	0.1146	0.1965	0.3329	0.6098	0.8390	0.9604	0.9959	1.0000
22	0.0390	0.1183	0.1934	0.3218	0.6190	0.8687	0.9769	0.9957	1.0000
23	0.0266	0.0987	0.1881	0.3276	0.6160	0.8934	0.9781	1.0000	1.0000
24	0.0283	0.0866	0.1764	0.3055	0.6142	0.9039	0.9874	1.0000	1.0000
25	0.0231	0.0740	0.1587	0.3020	0.6456	0.9029	0.9908	0.9985	1.0000
26	0.0203	0.0657	0.1221	0.2770	0.6291	0.9233	0.9922	1.0000	1.0000
27	0.0195	0.0405	0.1019	0.2684	0.6942	0.9655	1.0000	1.0000	1.0000
28	0.0165	0.0440	0.0972	0.2367	0.6862	0.9615	1.0000	1.0000	1.0000
29	0.0144	0.0485	0.0934	0.2154	0.7289	0.9749	0.9982	1.0000	1.0000
30	0.0133	0.0378	0.0844	0.1844	0.7067	0.9867	1.0000	1.0000	1.0000
31	0.0163	0.0463	0.0981	0.2452	0.7493	0.9782	1.0000	1.0000	1.0000
32	0.0038	0.0192	0.0654	0.1962	0.6962	0.9885	1.0000	1.0000	1.0000
33	0.0155	0.0622	0.1347	0.2694	0.6632	0.9482	0.9948	1.0000	1.0000
34	0.0059	0.0294	0.0765	0.2529	0.6941	0.9765	1.0000	1.0000	1.0000
35	0.0	0.0321	0.0705	0.2692	0.6923	0.9808	1.0000	1.0000	1.0000
36	0.0058	0.0234	0.0819	0.2398	0.7544	0.9825	1.0000	1.0000	1.0000
37	0.0	0.0068	0.0338	0.2297	0.7635	0.9662	1.0000	1.0000	1.0000
38	0.0	0.0	0.0306	0.2449	0.7755	0.9796	1.0000	1.0000	1.0000
39	0.0	0.0	0.0556	0.2361	0.7222	0.9722	1.0000	1.0000	1.0000
40	0.0	0.0	0.0196	0.3333	0.7647	0.9804	1.0000	1.0000	1.0000

TABLE B-6. TRANSITION PROBABILITY MATRIX: ST. LOUIS TRANSIT BUSES, NONFREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4
41	0.0	0.0	0.0	0.2813	0.5625	0.9375	1.0000	1.0000	1.0000
42	0.0	0.0244	0.0488	0.2683	0.8293	0.9512	0.9756	1.0000	1.0000
43	0.0	0.0	0.0909	0.3636	0.7273	0.9545	1.0000	1.0000	1.0000
44	0.0	0.0	0.1000	0.2000	0.8500	0.9500	1.0000	1.0000	1.0000
45	0.0	0.0	0.1000	0.3000	0.7000	0.8000	1.0000	1.0000	1.0000
46	0.0	0.0	0.0	0.5714	0.8571	1.0000	1.0000	1.0000	1.0000
47	0.0	0.0	0.0	0.0	0.6000	0.8000	1.0000	1.0000	1.0000
48	0.0	0.0	0.3333	0.6667	1.0000	1.0000	1.0000	1.0000	1.0000
49	0.0	0.0	0.0	0.3333	1.0000	1.0000	1.0000	1.0000	1.0000
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE B-7. INITIAL SPEED VS DELTA SPEED: ST. LOUIS EXPRESS BUSES, FREEWAY

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
0	0	0	0	0	125	3	0	0	0	128
1	0	0	0	2	6	0	1	1	0	10
2	0	0	0	1	1	0	1	0	0	3
3	0	0	2	2	0	1	1	0	1	7
4	0	0	1	0	5	1	0	2	0	9
5	0	0	2	3	2	3	1	1	0	12
6	0	1	1	1	0	3	0	0	0	6
7	0	0	3	2	1	0	0	1	1	8
8	0	1	1	0	1	1	1	1	0	6
9	1	0	2	0	0	0	0	0	0	3
10	0	1	1	0	2	2	0	0	0	6
11	0	2	0	2	0	1	1	0	0	6
12	1	0	0	0	2	1	0	1	1	6
13	0	1	1	0	7	2	0	0	0	11
14	1	2	1	2	3	3	1	0	0	13
15	0	1	0	3	5	1	1	0	0	11
16	0	2	1	1	0	1	0	0	1	6
17	0	0	0	0	0	0	0	0	0	0
18	2	1	1	0	5	1	0	0	0	10
19	0	2	0	1	1	1	1	0	0	6
20	1	0	2	1	0	1	0	0	1	6
21	0	1	1	1	4	4	1	1	0	13
22	0	1	1	2	7	7	0	0	0	18
23	2	2	0	3	6	5	2	1	0	21
24	1	2	1	1	4	7	0	1	0	17
25	0	0	1	3	6	3	2	0	0	15
26	0	2	3	2	1	3	2	0	0	13
27	2	1	1	3	0	1	2	1	0	11
28	1	0	0	2	0	1	2	0	0	6
29	1	0	5	2	0	1	3	0	0	12
30	0	1	1	3	0	1	2	1	0	9
31	0	1	2	1	0	3	1	0	0	8
32	2	1	1	3	11	4	1	1	0	24
33	1	0	2	4	13	6	1	0	0	27
34	0	1	3	5	8	8	2	0	0	27
35	0	1	1	8	23	10	2	0	0	45
36	0	1	2	9	28	14	2	0	0	56
37	1	0	3	12	19	10	3	1	0	49
38	0	2	1	14	6	7	3	0	0	33
39	0	0	1	12	20	7	4	0	0	44
40	0	1	2	14	17	10	3	0	0	47

TABLE B-7. INITIAL SPEED VS DELTA SPEED: ST. LOUIS EXPRESS BUSES, FREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4	TOTALS
41	0	1	3	15	24	12	3	0	0	58
42	0	0	1	24	22	11	3	0	0	61
43	0	0	3	21	33	11	3	0	0	71
44	0	0	3	15	28	15	4	0	0	65
45	0	0	4	14	31	17	1	0	0	67
46	0	1	4	21	28	17	3	0	0	74
47	0	0	3	16	68	20	2	0	0	109
48	0	2	[illegible]	23	54	31	1	0	0	115
49	0	2	1	28	98	34	2	0	0	165
50	0	0	3	38	134	45	1	0	0	221
51	0	1	5	46	160	47	2	0	0	261
52	0	0	1	42	164	59	5	0	0	271
53	0	0	11	56	164	63	1	0	0	295
54	0	0	2	57	130	63	6	1	0	259
55	0	0	5	73	201	131	5	0	0	415
56	0	0	6	115	321	129	0	0	0	571
57	0	0	6	100	509	78	2	0	0	695
58	0	0	1	61	598	86	0	0	0	746
59	0	0	1	60	525	63	0	0	0	649
60	0	0	0	53	511	72	0	1	0	637
61	0	0	2	54	545	67	3	0	0	671
62	0	1	1	56	363	129	2	0	0	552
63	0	0	1	98	257	127	6	0	0	489
64	0	0	7	81	236	69	0	0	0	393
65	0	0	1	54	230	73	5	0	0	363
66	0	0	1	54	130	76	2	0	0	263
67	0	0	6	65	116	33	0	0	0	220
68	0	0	3	17	82	5	0	0	0	107
69	0	0	0	8	39	8	0	0	0	55
70	0	0	0	5	25	4	0	0	0	34
71	0	0	0	3	18	5	0	0	0	26
72	0	0	0	0	5	1	0	0	0	6
73	0	0	0	0	3	0	0	0	0	3
74	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
TOTALS	17	40	140	1498	6191	1739	109	16	5	9755

TABLE B-8. TRANSITION PROBABILITY MATRIX: ST. LOUIS EXPRESS BUSES, FREEWAY

	-4	-3	-2	-1	0	1	2	3	4
0	0.0	0.0	0.0	0.0	0.9766	1.0000	1.0000	1.0000	1.0000
1	0.0	0.0	0.0	0.2000	0.8000	0.8000	0.9000	1.0000	1.0000
2	0.0	0.0	0.0	0.3333	0.6667	0.6667	1.0000	1.0000	1.0000
3	0.0	0.0	0.2857	0.5714	0.5714	0.7143	0.8571	0.8571	1.0000
4	0.0	0.0	0.1111	0.1111	0.6667	0.7778	0.7778	1.0000	1.0000
5	0.0	0.0	0.1667	0.4167	0.5833	0.8333	0.9167	1.0000	1.0000
6	0.0	0.1667	0.3333	0.5000	0.5000	1.0000	1.0000	1.0000	1.0000
7	0.0	0.0	0.3750	0.6250	0.7500	0.7500	0.7500	0.8750	1.0000
8	0.0	0.1667	0.3333	0.3333	0.5000	0.6667	0.8333	1.0000	1.0000
9	0.3333	0.3333	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	0.0	0.1667	0.3333	0.3333	0.6667	1.0000	1.0000	1.0000	1.0000
11	0.0	0.3333	0.3333	0.6667	0.6667	0.8333	1.0000	1.0000	1.0000
12	0.1667	0.1667	0.1667	0.1667	0.5000	0.6667	0.6667	0.8333	1.0000
13	0.0	0.0909	0.1818	0.1818	0.8182	1.0000	1.0000	1.0000	1.0000
14	0.0769	0.2308	0.3077	0.4615	0.6923	0.9231	1.0000	1.0000	1.0000
15	0.0	0.0909	0.0909	0.3636	0.8182	0.9091	1.0000	1.0000	1.0000
16	0.0	0.3333	0.5000	0.6667	0.6667	0.8333	0.8333	0.8333	1.0000
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.2000	0.3000	0.4000	0.4000	0.9000	1.0000	1.0000	1.0000	1.0000
19	0.0	0.3333	0.3333	0.5000	0.6667	0.8333	1.0000	1.0000	1.0000
20	0.1667	0.1667	0.5000	0.6667	0.6667	0.8333	0.8333	0.8333	1.0000
21	0.0	0.0769	0.1538	0.2308	0.5385	0.8462	0.9231	1.0000	1.0000
22	0.0	0.0556	0.1111	0.2222	0.6111	1.0000	1.0000	1.0000	1.0000
23	0.0952	0.1905	0.1905	0.3333	0.6190	0.8571	0.9524	1.0000	1.0000
24	0.0588	0.1765	0.2353	0.2941	0.5294	0.9412	0.9412	1.0000	1.0000
25	0.0	0.0	0.0667	0.2667	0.6667	0.8667	1.0000	1.0000	1.0000
26	0.0	0.1538	0.3846	0.5385	0.6154	0.8462	1.0000	1.0000	1.0000
27	0.1818	0.2727	0.3636	0.6364	0.6364	0.7273	0.9091	1.0000	1.0000
28	0.1667	0.1667	0.1667	0.5000	0.5000	0.6667	1.0000	1.0000	1.0000
29	0.0833	0.0833	0.5000	0.6667	0.6667	0.7500	1.0000	1.0000	1.0000
30	0.0	0.1111	0.2222	0.5556	0.5556	0.6667	0.8889	1.0000	1.0000
31	0.0	0.1250	0.3750	0.5000	0.5000	0.8750	1.0000	1.0000	1.0000
32	0.0833	0.1250	0.1667	0.2917	0.7500	0.9167	0.9583	1.0000	1.0000
33	0.0370	0.0370	0.1111	0.2593	0.7407	0.9630	1.0000	1.0000	1.0000
34	0.0	0.0370	0.1481	0.3333	0.6296	0.9259	1.0000	1.0000	1.0000
35	0.0	0.0222	0.0444	0.2222	0.7333	0.9556	1.0000	1.0000	1.0000
36	0.0	0.0179	0.0536	0.2143	0.7143	0.9643	1.0000	1.0000	1.0000
37	0.0204	0.0204	0.0816	0.3265	0.7143	0.9184	0.9796	1.0000	1.0000
38	0.0	0.0606	0.0909	0.5152	0.6970	0.9091	1.0000	1.0000	1.0000
39	0.0	0.0	0.0227	0.2955	0.7500	0.9091	1.0000	1.0000	1.0000
40	0.0	0.0213	0.0638	0.3617	0.7234	0.9362	1.0000	1.0000	1.0000

TABLE B-8. TRANSITION PROBABILITY MATRIX: ST. LOUIS EXPRESS BUSES, FREEWAY (CONTINUED)

	-4	-3	-2	-1	0	1	2	3	4
41	0.0	0.0172	0.0690	0.3276	0.7414	0.9483	1.0000	1.0000	1.0000
42	0.0	0.0	0.0164	0.4098	0.7705	0.9508	1.0000	1.0000	1.0000
43	0.0	0.0	0.0423	0.3380	0.8028	0.9577	1.0000	1.0000	1.0000
44	0.0	0.0	0.0462	0.2769	0.7077	0.9385	1.0000	1.0000	1.0000
45	0.0	0.0	0.0597	0.2687	0.7313	0.9851	1.0000	1.0000	1.0000
46	0.0	0.0135	0.0676	0.3514	0.7297	0.9595	1.0000	1.0000	1.0000
47	0.0	0.0	0.0275	0.1743	0.7982	0.9817	1.0000	1.0000	1.0000
48	0.0	0.0174	0.0522	0.2522	0.7217	0.9913	1.0000	1.0000	1.0000
49	0.0	0.0121	0.0182	0.1879	0.7818	0.9879	1.0000	1.0000	1.0000
50	0.0	0.0	0.0136	0.1855	0.7919	0.9955	1.0000	1.0000	1.0000
51	0.0	0.0038	0.0230	0.1992	0.8123	0.9923	1.0000	1.0000	1.0000
52	0.0	0.0	0.0037	0.1587	0.7638	0.9815	1.0000	1.0000	1.0000
53	0.0	0.0	0.0373	0.2271	0.7831	0.9966	1.0000	1.0000	1.0000
54	0.0	0.0	0.0077	0.2278	0.7297	0.9730	0.9961	1.0000	1.0000
55	0.0	0.0	0.0120	0.1880	0.6723	0.9880	1.0000	1.0000	1.0000
56	0.0	0.0	0.0105	0.2119	0.7741	1.0000	1.0000	1.0000	1.0000
57	0.0	0.0	0.0086	0.1525	0.8849	0.9971	1.0000	1.0000	1.0000
58	0.0	0.0	0.0013	0.0831	0.8847	1.0000	1.0000	1.0000	1.0000
59	0.0	0.0	0.0015	0.0940	0.9029	1.0000	1.0000	1.0000	1.0000
60	0.0	0.0	0.0	0.0832	0.8854	0.9984	0.9984	1.0000	1.0000
61	0.0	0.0	0.0030	0.0835	0.8957	0.9955	1.0000	1.0000	1.0000
62	0.0	0.0018	0.0036	0.1051	0.7627	0.9964	1.0000	1.0000	1.0000
63	0.0	0.0	0.0020	0.2025	0.7280	0.9877	1.0000	1.0000	1.0000
64	0.0	0.0	0.0178	0.2239	0.8244	1.0000	1.0000	1.0000	1.0000
65	0.0	0.0	0.0028	0.1515	0.7851	0.9862	1.0000	1.0000	1.0000
66	0.0	0.0	0.0038	0.2091	0.7034	0.9924	1.0000	1.0000	1.0000
67	0.0	0.0	0.0273	0.3227	0.8500	1.0000	1.0000	1.0000	1.0000
68	0.0	0.0	0.0280	0.1869	0.9533	1.0000	1.0000	1.0000	1.0000
69	0.0	0.0	0.0	0.1455	0.8545	1.0000	1.0000	1.0000	1.0000
70	0.0	0.0	0.0	0.1471	0.8824	1.0000	1.0000	1.0000	1.0000
71	0.0	0.0	0.0	0.1154	0.8077	1.0000	1.0000	1.0000	1.0000
72	0.0	0.0	0.0	0.0	0.8333	1.0000	1.0000	1.0000	1.0000
73	0.0	0.0	0.0	0.0	1.0000	1.0000	1.0000	1.0000	1.0000
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix C

SELECTED CYCLE PLOTS AND DRIVING SCHEDULES

This appendix contains cycle plots and driving schedules for all St. Louis trucks, freeway and nonfreeway, and for St. Louis transit buses, nonfreeway.

FIGURE C-1.

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1324759221

DATA BASE: ALL ST. LOUIS
TRUCKS, FREEWAY

AVERAGE SPEED = 54.23 MPH
DURATION = 10.00 MIN
DISTANCE = 9.04 MILES

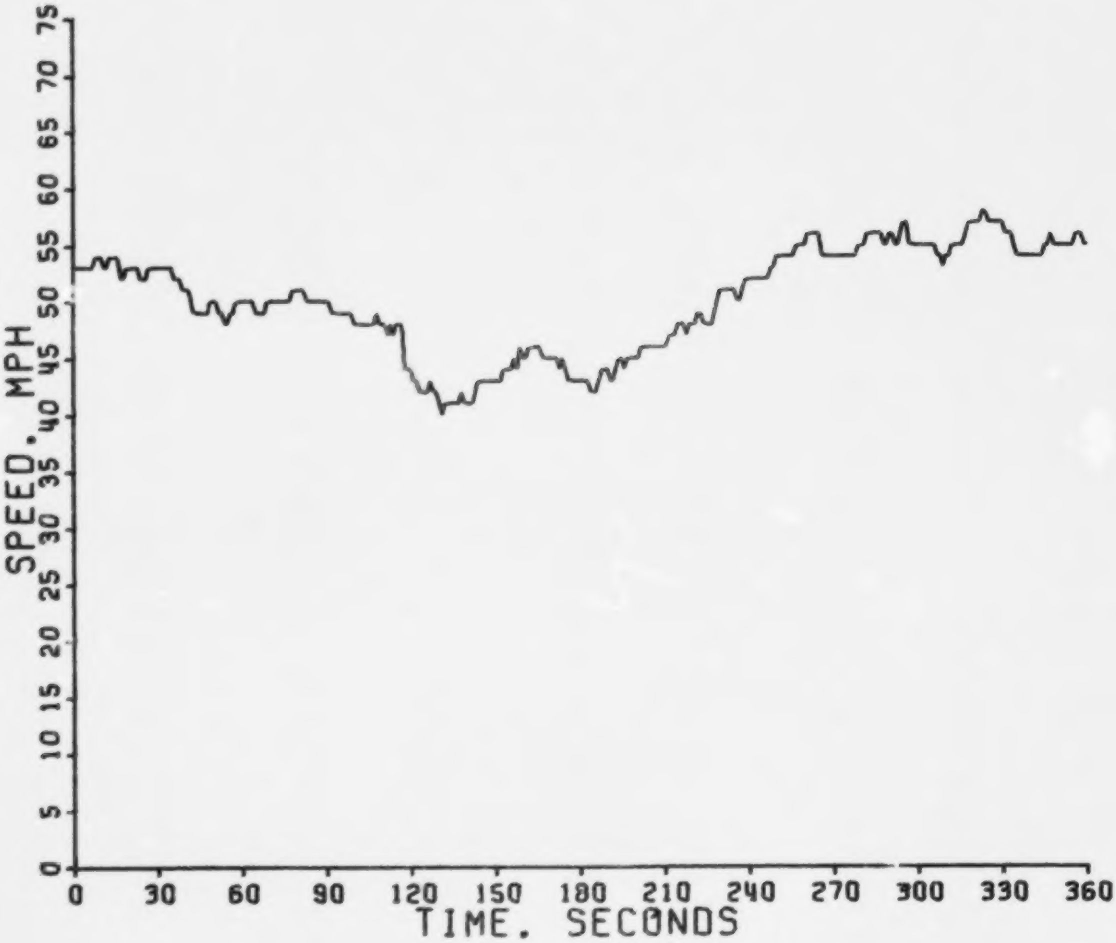

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TABLE C-1. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1324759221

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 1 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
0	53						
1	53	51	50	101	48	151	43
2	53	52	49	102	48	152	43
3	53	53	49	103	48	153	44
4	53	54	48	104	48	154	44
5	53	55	48	105	48	155	44
6	53	56	49	106	48	156	44
7	53	57	49	107	48	157	45
8	54	58	50	108	49	158	44
9	54	59	50	109	48	159	46
10	54	60	50	110	48	160	45
11	53	61	50	111	48	161	45
12	53	62	50	112	47	162	46
13	54	63	50	113	48	163	46
14	54	64	50	114	47	164	46
15	54	65	49	115	48	165	46
16	54	66	49	116	48	166	46
17	52	67	49	117	48	167	45
18	52	68	49	118	44	168	45
19	53	69	50	119	44	169	45
20	53	70	50	120	44	170	45
21	53	71	50	121	43	171	45
22	53	72	50	122	43	172	45
23	53	73	50	123	42	173	44
24	52	74	50	124	42	174	45
25	52	75	50	125	42	175	44
26	52	76	50	126	42	176	43
27	53	77	50	127	43	177	43
28	53	78	51	128	42	178	43
29	53	79	51	129	42	179	43
30	53	80	51	130	41	180	43
31	53	81	51	131	40	181	43
32	53	82	51	132	41	182	43
33	53	83	50	133	41	183	43
34	53	84	50	134	41	184	42
35	53	85	50	135	41	185	42
36	52	86	50	136	41	186	42
37	52	87	50	137	41	187	43
38	52	88	50	138	42	188	44
39	51	89	50	139	41	189	44
40	51	90	50	140	41	190	44
41	51	91	50	141	41	191	43
42	50	92	49	142	41	192	43
43	49	93	49	143	42	193	44
44	49	94	49	144	43	194	45
45	49	95	49	145	43	195	45
46	49	96	49	146	43	196	44
47	49	97	49	147	43	197	45
48	49	98	49	148	43	198	45
49	50	99	49	149	43	199	45
50	50	100	48	150	43	200	45

TABLE C-1. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1324759221 (CONTINUED)

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 2 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
201	45	251	54	301	55	351	55
202	46	252	54	302	55	352	55
203	46	253	54	303	55	353	55
204	46	254	54	304	55	354	55
205	46	255	54	305	55	355	55
206	46	256	54	306	55	356	56
207	46	257	55	307	54	357	56
208	46	258	55	308	54	358	56
209	46	259	55	309	53	359	55
210	46	260	55	310	54	360	55
211	46	261	56	311	54	361	56
212	47	262	56	312	55	362	56
213	47	263	56	313	55	363	56
214	47	264	56	314	55	364	57
215	48	265	56	315	55	365	57
216	48	266	54	316	55	366	57
217	48	267	54	317	56	367	57
218	47	268	54	318	57	368	57
219	48	269	54	319	57	369	57
220	48	270	54	320	57	370	57
221	48	271	54	321	57	371	57
222	49	272	54	322	57	372	57
223	49	273	54	323	58	373	57
224	48	274	54	324	58	374	57
225	48	275	54	325	57	375	57
226	48	276	54	326	57	376	57
227	48	277	54	327	57	377	57
228	49	278	54	328	57	378	57
229	50	279	55	329	57	379	57
230	51	280	55	330	57	380	57
231	51	281	55	331	56	381	57
232	51	282	56	332	56	382	57
233	51	283	56	333	56	383	57
234	51	284	56	334	55	384	57
235	51	285	56	335	54	385	57
236	50	286	56	336	54	386	57
237	50	287	56	337	54	387	56
238	51	288	55	338	54	388	55
239	52	289	55	339	54	389	56
240	52	290	56	340	54	390	56
241	52	291	56	341	54	391	57
242	52	292	55	342	54	392	57
243	52	293	55	343	54	393	57
244	52	294	56	344	54	394	56
245	52	295	57	345	55	395	56
246	52	296	57	346	55	396	57
247	52	297	55	347	56	397	57
248	53	298	55	348	55	398	57
249	53	299	55	349	55	399	57
250	54	300	55	350	55	400	57

TABLE C-1. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1324759221 (CONTINUED)

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 3 OF 3

SECCND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
401	57	451	59	501	61	551	66
402	58	452	59	502	61	552	66
403	58	453	59	503	61	553	66
404	59	454	59	504	61	554	66
405	59	455	59	505	61	555	66
406	59	456	58	506	61	556	66
407	59	457	58	507	61	557	66
408	60	458	58	508	61	558	65
409	60	459	58	509	60	559	65
410	60	460	58	510	60	560	65
411	59	461	59	511	60	561	65
412	59	462	59	512	60	562	64
413	59	463	59	513	60	563	64
414	59	464	59	514	60	564	64
415	59	465	59	515	60	565	64
416	59	466	59	516	60	566	64
417	59	467	59	517	60	567	64
418	59	468	59	518	60	568	64
419	59	469	59	519	60	569	64
420	59	470	59	520	60	570	64
421	59	471	59	521	60	571	64
422	59	472	59	522	60	572	64
423	59	473	59	523	61	573	64
424	59	474	59	524	61	574	64
425	59	475	59	525	62	575	64
426	59	476	59	526	63	576	64
427	59	477	59	527	63	577	64
428	59	478	59	528	63	578	64
429	59	479	59	529	62	579	63
430	59	480	59	530	62	580	62
431	59	481	59	531	61	581	63
432	59	482	60	532	62	582	63
433	60	483	60	533	62	583	63
434	60	484	60	534	62	584	63
435	60	485	60	535	62	585	63
436	60	486	60	536	62	586	64
437	60	487	60	537	62	587	64
438	60	488	60	538	63	588	64
439	60	489	61	539	63	589	64
440	60	490	61	540	64	590	64
441	60	491	61	541	65	591	64
442	59	492	61	542	65	592	64
443	59	493	61	543	65	593	64
444	59	494	62	544	65	594	65
445	59	495	62	545	65	595	65
446	59	496	61	546	66	596	64
447	59	497	61	547	66	597	64
448	59	498	61	548	66	598	64
449	59	499	61	549	66	599	64
450	59	500	61	550	67	600	64

FIGURE C-1. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1324759221

DATA BASE: ALL ST. LOUIS
TRUCKS, FREEWAY

AVERAGE SPEED = 54.23 MPH
DURATION = 10.00 MIN
DISTANCE = 9.04 MILES

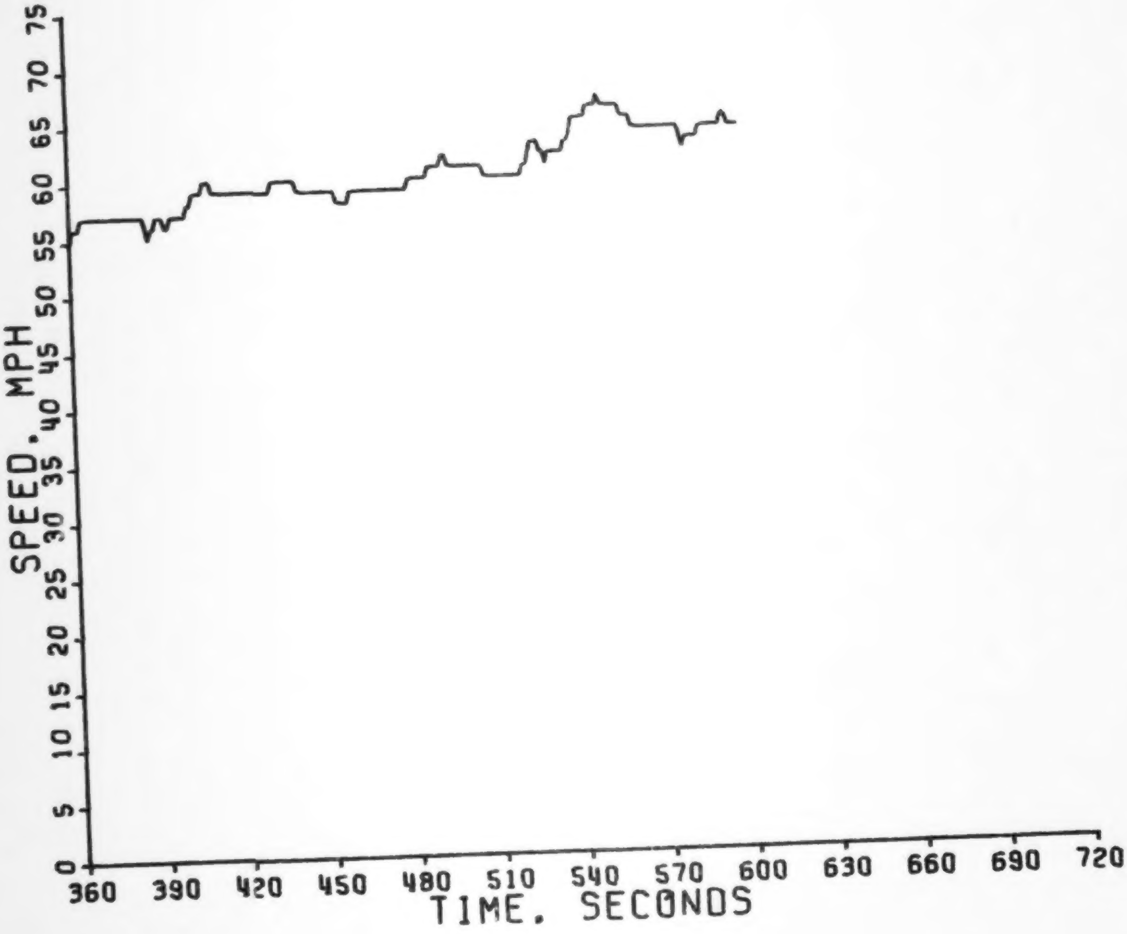

FIGURE C-2.

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 5375700631

DATA BASE: ALL ST. LOUIS
TRUCKS, FREEWAY

AVERAGE SPEED = 53.83 MPH
DURATION = 20.00 MIN
DISTANCE = 17.94 MILES

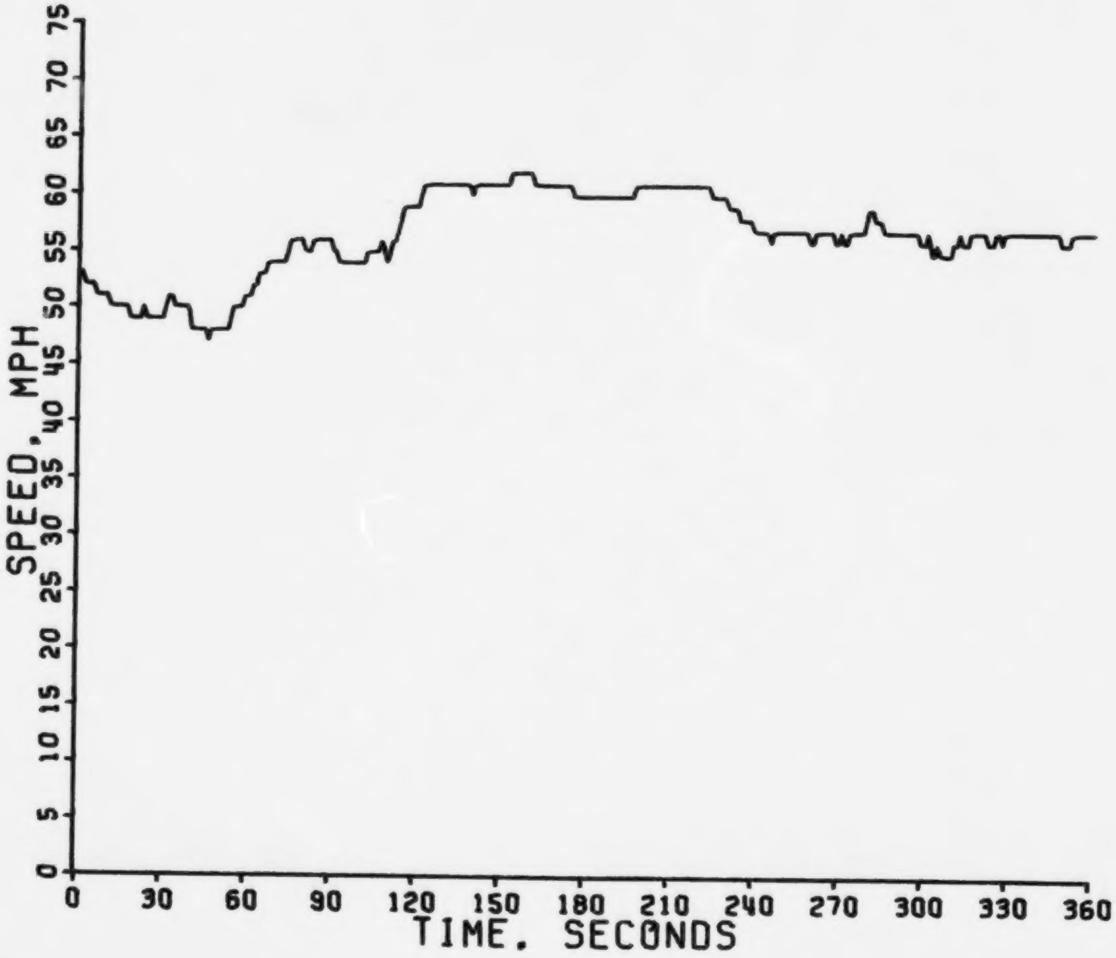

FIGURE C-2. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 5375700631

DATA BASE: ALL ST. LOUIS
TRUCKS, FREEWAY

AVERAGE SPEED = 53.83 MPH
DURATION = 20.00 MIN
DISTANCE = 17.94 MILES

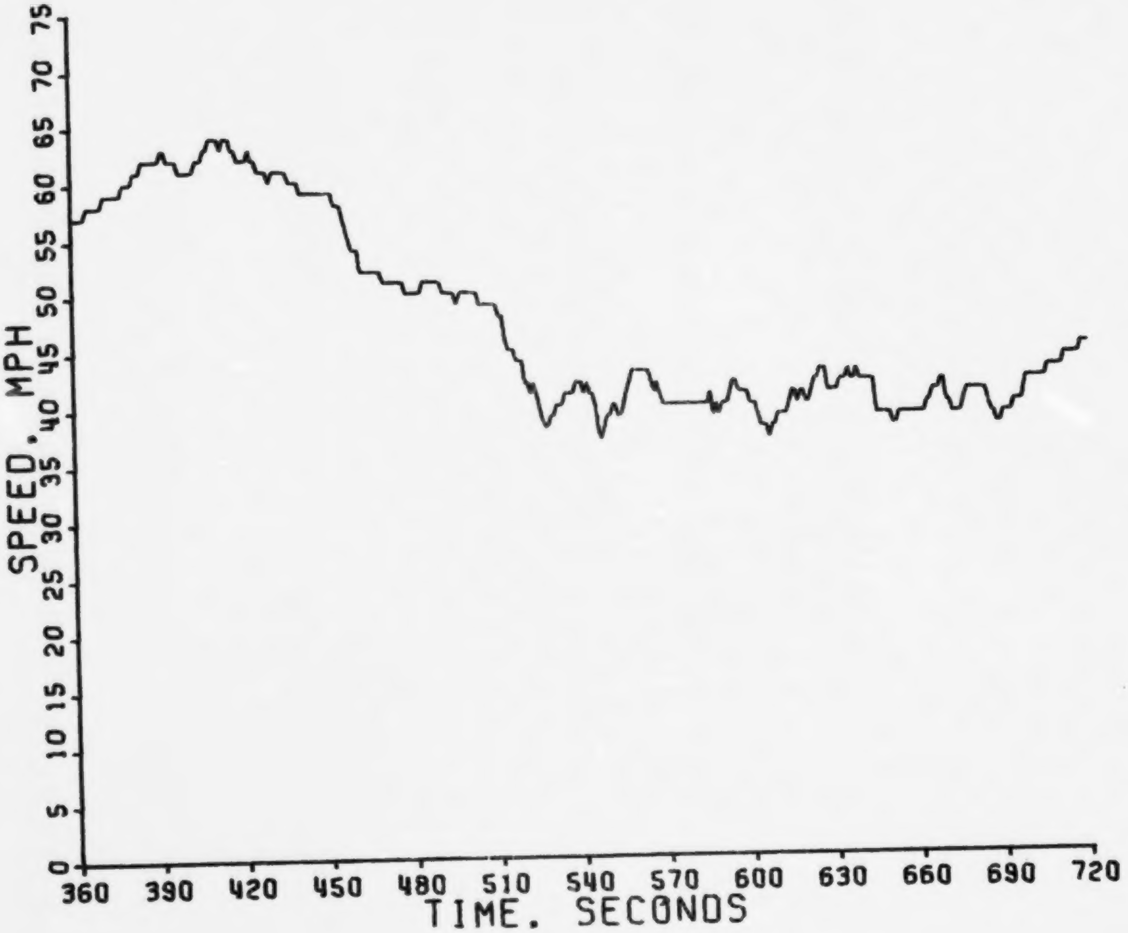

TABLE C-2. DRIVING CYCLE WITH STARTING RANDOM NUMBER 5375700631

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 1 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
0	53						
1	53	51	48	101	54	151	61
2	52	52	48	102	55	152	61
3	52	53	48	103	55	153	62
4	52	54	49	104	55	154	62
5	52	55	50	105	55	155	62
6	51	56	50	106	55	156	62
7	51	57	50	107	56	157	62
8	51	58	50	108	55	158	62
9	51	59	51	109	54	159	62
10	51	60	51	110	55	160	62
11	50	61	51	111	56	161	61
12	50	62	52	112	56	162	61
13	50	63	52	113	57	163	61
14	50	64	53	114	58	164	61
15	50	65	53	115	59	165	61
16	50	66	53	116	59	166	61
17	50	67	54	117	59	167	61
18	49	68	54	118	59	168	61
19	49	69	54	119	59	169	61
20	49	70	54	120	59	170	61
21	49	71	54	121	60	171	61
22	49	72	54	122	61	172	61
23	50	73	54	123	61	173	61
24	49	74	55	124	61	174	61
25	49	75	56	125	61	175	60
26	49	76	56	126	61	176	60
27	49	77	56	127	61	177	60
28	49	78	56	128	61	178	60
29	49	79	56	129	61	179	60
30	49	80	55	130	61	180	60
31	50	81	55	131	61	181	60
32	51	82	55	132	61	182	60
33	51	83	56	133	61	183	60
34	50	84	56	134	61	184	60
35	50	85	56	135	61	185	60
36	50	86	56	136	61	186	60
37	50	87	56	137	61	187	60
38	50	88	56	138	61	188	60
39	50	89	56	139	60	189	60
40	48	90	55	140	61	190	60
41	48	91	55	141	61	191	60
42	48	92	54	142	61	192	60
43	48	93	54	143	61	193	60
44	48	94	54	144	61	194	60
45	48	95	54	145	61	195	60
46	47	96	54	146	61	196	60
47	48	97	54	147	61	197	61
48	48	98	54	148	61	198	61
49	48	99	54	149	61	199	61
50	48	100	54	150	61	200	61

FIGURE C-2. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 5375700631

DATA BASE: ALL ST. LOUIS
TRUCKS, FREEWAY

AVERAGE SPEED = 53.83 MPH
DURATION = 20.00 MIN
DISTANCE = 17.94 MILES

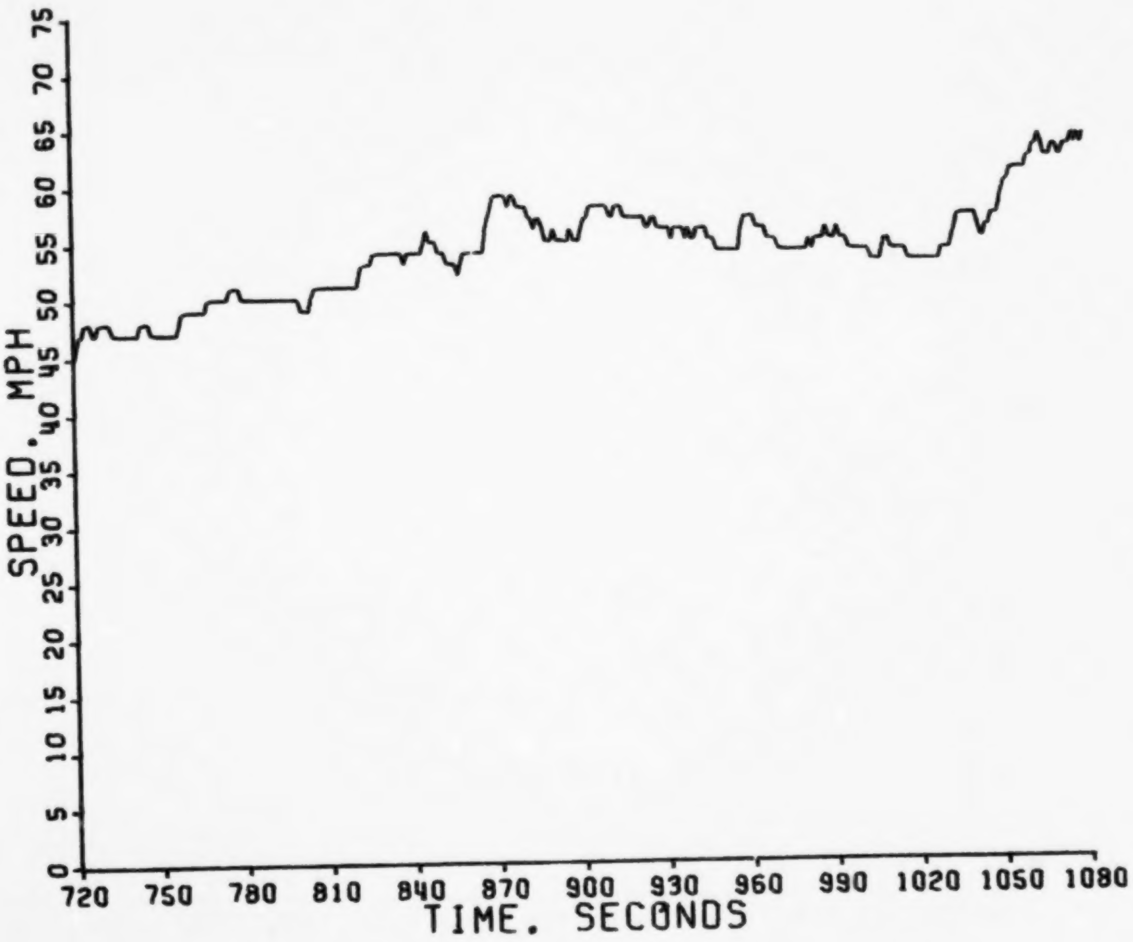

FIGURE C-2. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 5375700631

DATA BASE: ALL ST. LOUIS
TRUCKS, FREEWAY

AVERAGE SPEED = 53.83 MPH
DURATION = 20.00 MIN
DISTANCE = 17.94 MILES

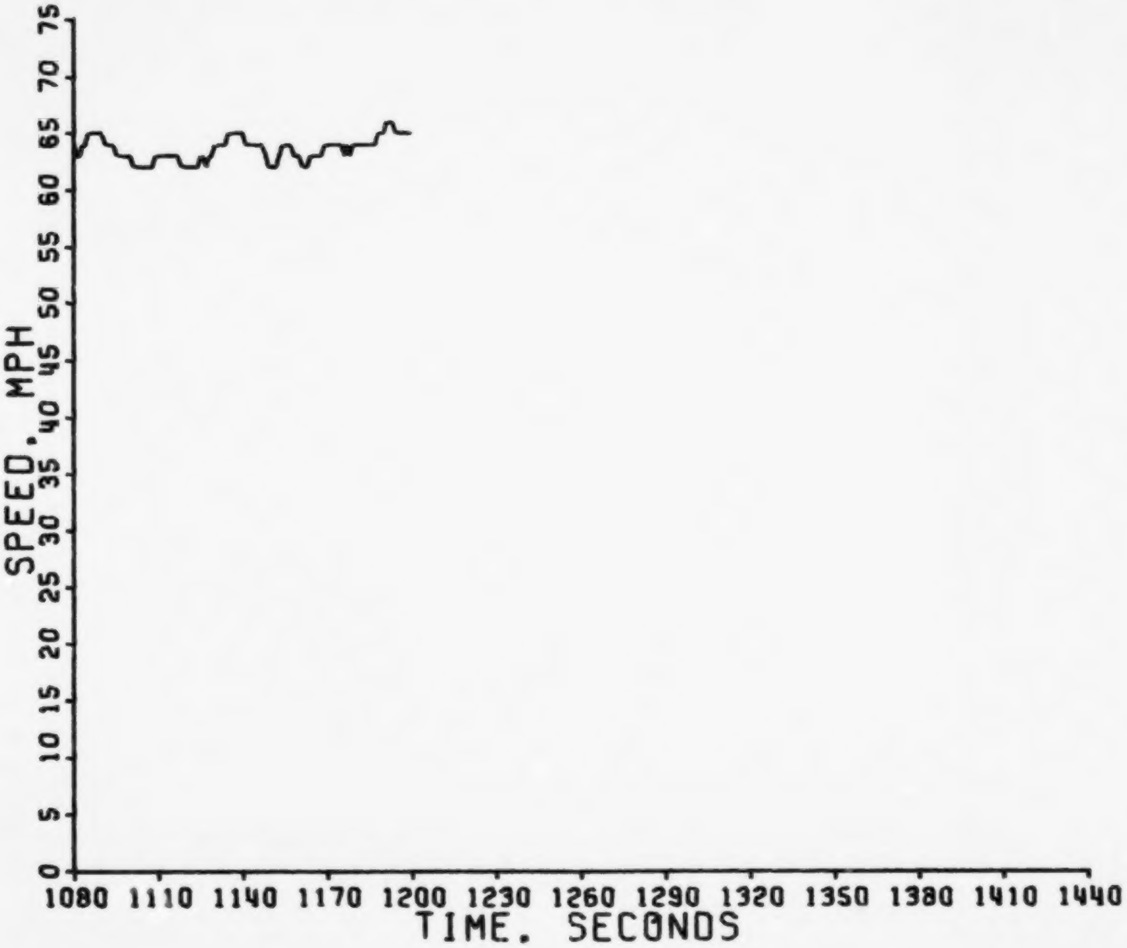

TABLE C-2. DRIVING CYCLE WITH STARTING RANDOM NUMBER 5375700631 (CONTINUED)

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 2 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
201	61	251	57	301	57	351	56
202	61	252	57	302	55	352	57
203	61	253	57	303	55	353	57
204	61	254	57	304	56	354	57
205	61	255	57	305	55	355	57
206	61	256	57	306	55	356	57
207	61	257	57	307	55	357	57
208	61	258	57	308	55	358	57
209	61	259	56	309	55	359	57
210	61	260	56	310	56	360	57
211	61	261	57	311	56	361	57
212	61	262	57	312	57	362	57
213	61	263	57	313	56	363	57
214	61	264	57	314	56	364	57
215	61	265	57	315	56	365	58
216	61	266	57	316	57	366	58
217	61	267	57	317	57	367	58
218	61	268	56	318	57	368	58
219	61	269	56	319	57	369	58
220	61	270	57	320	57	370	58
221	61	271	56	321	57	371	59
222	61	272	56	322	56	372	59
223	61	273	57	323	56	373	59
224	60	274	57	324	56	374	59
225	60	275	57	325	57	375	59
226	60	276	57	326	57	376	59
227	60	277	57	327	56	377	59
228	60	278	57	328	57	378	60
229	60	279	58	329	57	379	60
230	59	280	59	330	57	380	60
231	59	281	59	331	57	381	60
232	59	282	58	332	57	382	61
233	59	283	58	333	57	383	61
234	58	284	58	334	57	384	61
235	58	285	57	335	57	385	62
236	58	286	57	336	57	386	62
237	58	287	57	337	57	387	62
238	58	288	57	338	57	388	62
239	57	289	57	339	57	389	62
240	57	290	57	340	57	390	62
241	57	291	57	341	57	391	62
242	57	292	57	342	57	392	63
243	57	293	57	343	57	393	63
244	57	294	57	344	57	394	62
245	56	295	57	345	57	395	62
246	57	296	57	346	57	396	62
247	57	297	57	347	57	397	62
248	57	298	56	348	56	398	61
249	57	299	56	349	56	399	61
250	57	300	56	350	56	400	61

TABLE C-2. DRIVING CYCLE WITH STARTING RANDOM NUMBER 5375700631 (CONTINUED)

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 3 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
401	61	451	59	501	50	551	40
402	61	452	59	502	50	552	40
403	61	453	58	503	50	553	39
404	62	454	58	504	49	554	39
405	62	455	58	505	49	555	40
406	62	456	57	506	49	556	41
407	63	457	56	507	49	557	42
4C8	63	458	55	508	49	558	43
409	64	459	54	509	49	559	43
410	64	460	54	510	49	560	43
411	64	461	54	511	48	561	43
412	64	462	52	512	48	562	43
413	63	463	52	513	46	563	43
414	64	464	52	514	45	564	43
415	64	465	52	515	45	565	42
416	64	466	52	516	45	566	41
417	63	467	52	517	44	567	42
418	63	468	52	518	44	568	41
419	62	469	52	519	44	569	40
420	62	470	51	520	42	570	40
421	62	471	51	521	42	571	40
422	62	472	51	522	41	572	40
423	63	473	51	523	42	573	40
424	62	474	51	524	41	574	40
425	62	475	51	525	40	575	40
426	61	476	51	526	39	576	40
427	61	477	51	527	38	577	40
428	61	478	50	528	38	578	40
429	61	479	50	529	39	579	40
430	60	480	50	530	39	580	40
431	61	481	50	531	40	581	40
432	61	482	50	532	40	582	40
433	61	483	50	533	40	583	40
434	61	484	51	534	41	584	40
435	61	485	51	535	41	585	40
436	61	486	51	536	41	586	41
437	60	487	51	537	41	587	39
438	60	488	51	538	42	588	40
439	60	489	51	539	42	589	39
440	60	490	51	540	42	590	40
441	59	491	50	541	41	591	40
442	59	492	50	542	42	592	40
443	59	493	50	543	41	593	41
444	59	494	50	544	41	594	42
445	59	495	50	545	40	595	42
446	59	496	49	546	38	596	41
447	59	497	50	547	37	597	41
448	59	498	50	548	38	598	41
449	59	499	50	549	39	599	41
450	59	500	50	550	39	600	40

TABLE C-2. DRIVING CYCLE WITH STARTING RANDOM NUMBER 5375700631 (CONTINUED)

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 4 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
601	40	651	38	701	42	751	47
602	40	652	38	702	42	752	47
603	39	653	39	703	42	753	47
604	38	654	39	704	42	754	47
605	38	655	39	705	42	755	47
606	38	656	39	706	43	756	47
607	37	657	39	707	43	757	47
608	38	658	39	708	43	758	48
609	38	659	39	709	43	759	49
610	39	660	39	710	43	760	49
611	39	661	39	711	43	761	49
612	39	662	39	712	44	762	49
613	39	663	40	713	44	763	49
614	40	664	40	714	44	764	49
615	41	665	41	715	44	765	49
616	41	666	41	716	44	766	49
617	40	667	41	717	44	767	49
618	41	668	42	718	45	768	50
619	41	669	42	719	45	769	50
620	40	670	40	720	45	770	50
621	40	671	40	721	46	771	50
622	41	672	39	722	47	772	50
623	42	673	39	723	47	773	50
624	42	674	39	724	48	774	50
625	43	675	39	725	48	775	50
626	43	676	40	726	48	776	51
627	43	677	41	727	47	777	51
628	41	678	41	728	47	778	51
629	41	679	41	729	48	779	51
630	41	680	41	730	48	780	50
631	41	681	41	731	48	781	50
632	42	682	41	732	48	782	50
633	42	683	41	733	48	783	50
634	42	684	41	734	47	784	50
635	43	685	40	735	47	785	50
636	42	686	39	736	47	786	50
637	42	687	39	737	47	787	50
638	43	688	38	738	47	788	50
639	42	689	38	739	47	789	50
640	42	690	39	740	47	790	50
641	42	691	39	741	47	791	50
642	42	692	39	742	47	792	50
643	42	693	39	743	47	793	50
644	42	694	40	744	48	794	50
645	39	695	40	745	48	795	50
646	39	696	40	746	48	796	50
647	39	697	40	747	48	797	50
648	39	698	42	748	47	798	50
649	39	699	42	749	47	799	50
650	39	700	42	750	47	800	50

TABLE C-2. DRIVING CYCLE WITH STARTING RANDOM NUMBER 5375700631 (CONTINUED)

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 5 OF 6

SECCND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
801	49	851	54	901	56	951	54
802	49	852	54	902	57	952	54
803	49	853	53	903	57	953	54
804	49	854	53	904	58	954	54
805	50	855	53	905	58	955	54
806	51	856	53	906	58	956	54
807	51	857	52	9C7	58	957	54
808	51	858	53	908	58	958	56
809	51	859	54	909	58	959	57
810	51	860	54	910	58	960	57
811	51	861	54	911	57	961	57
812	51	862	54	912	57	962	57
813	51	863	54	913	58	963	56
814	51	864	54	914	58	964	56
815	51	865	54	915	58	965	56
816	51	866	54	916	57	966	56
817	51	867	56	917	57	967	55
818	51	868	57	918	57	968	55
819	51	869	58	919	57	969	55
820	51	870	59	920	57	970	55
821	51	871	59	921	57	971	54
822	52	872	59	922	57	972	54
823	53	873	59	923	57	973	54
824	53	874	59	924	56	974	54
825	53	875	58	925	56	975	54
826	53	876	59	926	57	976	54
827	54	877	59	927	57	977	54
828	54	878	58	928	56	978	54
829	54	879	58	929	56	979	54
830	54	880	58	930	56	980	54
831	54	881	58	931	56	981	54
832	54	882	57	932	56	982	55
833	54	883	57	933	55	983	54
834	54	884	56	934	56	984	55
835	54	885	57	935	56	985	55
836	54	886	57	936	56	986	55
837	54	887	56	937	56	987	55
838	53	888	55	938	55	988	56
839	54	889	55	939	56	989	55
840	54	890	55	940	55	990	55
841	54	891	56	941	55	991	55
842	54	892	55	942	56	992	56
843	54	893	55	943	56	993	55
844	54	894	55	944	56	994	55
845	55	895	55	945	56	995	55
846	56	896	55	946	55	996	54
847	55	897	56	947	55	997	54
848	55	898	55	948	55	998	54
849	55	899	55	949	54	999	54
850	54	900	55	950	54	1000	54

TABLE C-2. DRIVING CYCLE WITH STARTING RANDOM NUMBER 5375700631 (CONTINUED)

ALL ST. LOUIS TRUCKS, FREEWAY

PAGE 6 OF 6

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
1001	54	1051	59	1101	62	1151	62
1002	54	1052	60	1102	62	1152	62
1003	54	1053	60	1103	62	1153	63
1004	53	1054	61	1104	62	1154	64
1005	53	1055	61	1105	62	1155	64
1006	53	1056	61	1106	62	1156	64
1007	53	1057	61	1107	62	1157	64
1008	54	1058	61	1108	62	1158	63
1009	55	1059	61	1109	63	1159	63
1010	55	1060	62	1110	63	1160	63
1011	54	1061	62	1111	63	1161	62
1012	54	1062	63	1112	63	1162	62
1013	54	1063	63	1113	63	1163	62
1014	54	1064	64	1114	63	1164	63
1015	54	1065	63	1115	63	1165	63
1016	54	1066	62	1116	63	1166	63
1017	53	1067	62	1117	63	1167	63
1018	53	1068	62	1118	62	1168	63
1019	53	1069	63	1119	62	1169	64
1020	53	1070	63	1120	62	1170	64
1021	53	1071	62	1121	62	1171	64
1022	53	1072	62	1122	62	1172	64
1023	53	1073	63	1123	62	1173	64
1024	53	1074	63	1124	62	1174	64
1025	53	1075	63	1125	63	1175	64
1026	53	1076	64	1126	63	1176	63
1027	53	1077	63	1127	62	1177	64
1028	53	1078	64	1128	63	1178	63
1029	54	1079	63	1129	63	1179	64
1030	54	1080	64	1130	64	1180	64
1031	54	1081	63	1131	64	1181	64
1032	54	1082	63	1132	64	1182	64
1033	55	1083	64	1133	64	1183	64
1034	56	1084	64	1134	64	1184	64
1035	57	1085	65	1135	65	1185	64
1036	57	1086	65	1136	65	1186	64
1037	57	1087	65	1137	65	1187	64
1038	57	1088	65	1138	65	1188	65
1039	57	1089	65	1139	65	1189	65
1040	57	1090	65	1140	65	1190	65
1041	57	1091	64	1141	64	1191	66
1042	56	1092	64	1142	64	1192	66
1043	55	1093	64	1143	64	1193	66
1044	55	1094	64	1144	64	1194	65
1045	56	1095	63	1145	64	1195	65
1046	56	1096	63	1146	64	1196	65
1047	57	1097	63	1147	64	1197	65
1048	57	1098	63	1148	63	1198	65
1049	57	1099	63	1149	62	1199	65
1050	58	1100	63	1150	62	1200	65

FIGURE C-3.

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1567897373

DATA BASE: ALL ST. LOUIS
TRUCKS, NONFREEWAY

AVERAGE SPEED = 16.03 MPH
DURATION = 9.33 MIN
DISTANCE = 2.49 MILES

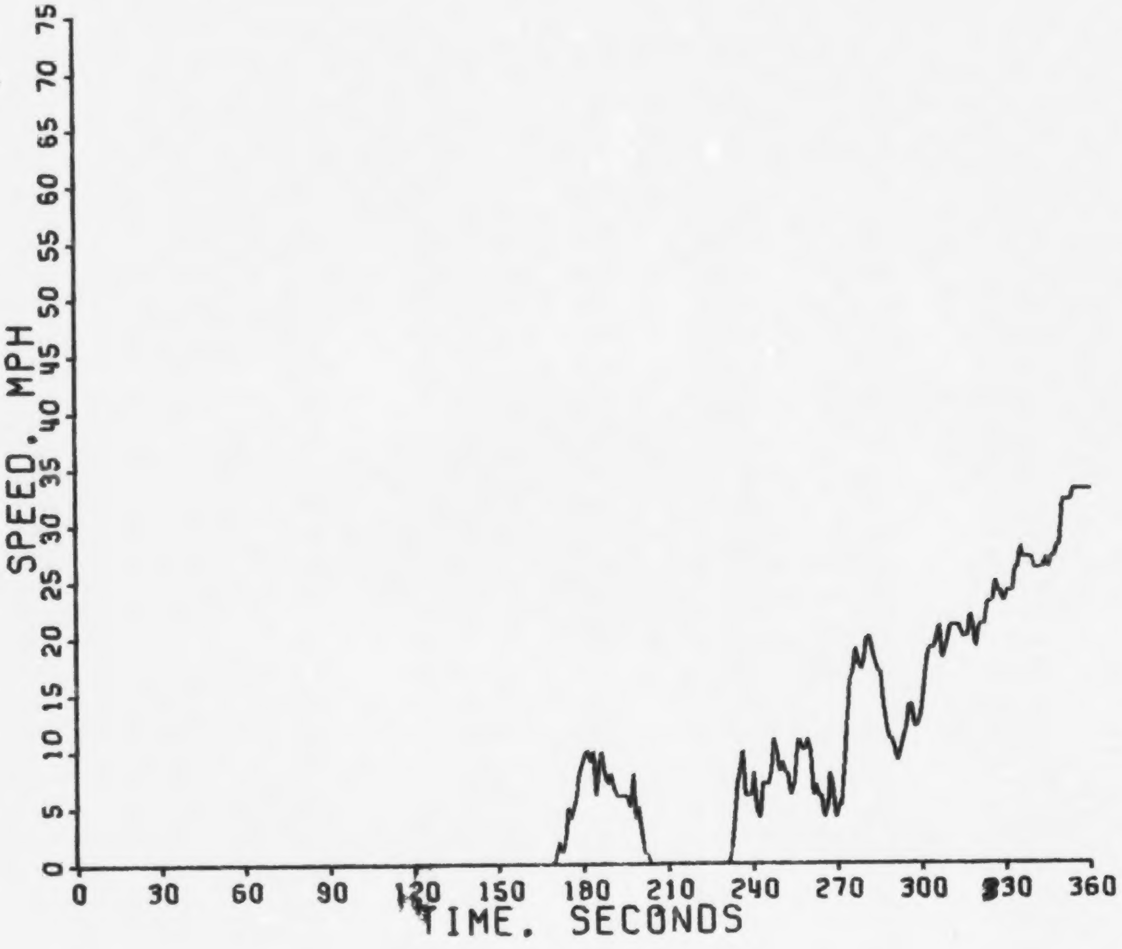

TABLE C-3. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1567897373

ALL ST. LOUIS TRUCKS, NONFREEWAY

PAGE 1 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
0	0						
1	0	51	0	101	0	151	0
2	0	52	0	102	0	152	0
3	0	53	0	103	0	153	0
4	0	54	0	104	0	154	0
5	0	55	0	105	0	155	0
6	0	56	0	106	0	156	0
7	0	57	0	107	0	157	0
8	0	58	0	108	0	158	0
9	0	59	0	109	0	159	0
10	0	60	0	110	0	160	0
11	0	61	0	111	0	161	0
12	0	62	0	112	0	162	0
13	0	63	0	113	0	163	0
14	0	64	0	114	0	164	0
15	0	65	0	115	0	165	0
16	0	66	0	116	0	166	0
17	0	67	0	117	0	167	0
18	0	68	0	118	0	168	0
19	0	69	0	119	0	169	0
20	0	70	0	120	0	170	1
21	0	71	0	121	0	171	2
22	0	72	0	122	0	172	1
23	0	73	0	123	0	173	2
24	0	74	0	124	0	174	5
25	0	75	0	125	0	175	4
26	0	76	0	126	0	176	5
27	0	77	0	127	0	177	6
28	0	78	0	128	0	178	8
29	0	79	0	129	0	179	9
30	0	80	0	130	0	180	10
31	0	81	0	131	0	181	10
32	0	82	0	132	0	182	9
33	0	83	0	133	0	183	10
34	0	84	0	134	0	184	6
35	0	85	0	135	0	185	9
36	0	86	0	136	0	186	10
37	0	87	0	137	0	187	8
38	0	88	0	138	0	188	7
39	0	89	0	139	0	189	8
40	0	90	0	140	0	190	7
41	0	91	0	141	0	191	6
42	0	92	0	142	0	192	6
43	0	93	0	143	0	193	6
44	0	94	0	144	0	194	6
45	0	95	0	145	0	195	6
46	0	96	0	146	0	196	5
47	0	97	0	147	0	197	8
48	0	98	0	148	0	198	4
49	0	99	0	149	0	199	5
50	0	100	0	150	0	200	3

TABLE C-3. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1567897373 (CONTINUED)

ALL ST. LOUIS TRUCKS, NONFREEWAY

PAGE 2 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
201	1	251	8	301	17	351	32
202	1	252	8	302	19	352	32
203	0	253	6	303	19	353	32
204	0	254	7	304	19	354	33
205	0	255	10	305	20	355	33
206	0	256	11	306	21	356	33
207	0	257	10	307	18	357	33
208	0	258	10	308	19	358	33
209	0	259	11	309	20	359	33
210	0	260	10	310	21	360	33
211	0	261	6	311	21	361	34
212	0	262	7	312	21	362	35
213	0	263	6	313	21	363	35
214	0	264	6	314	20	364	35
215	0	265	4	315	20	365	35
216	0	266	5	316	20	366	35
217	0	267	8	317	22	367	36
218	0	268	7	318	21	368	36
219	0	269	4	319	19	369	36
220	0	270	5	320	21	370	36
221	0	271	5	321	21	371	37
222	0	272	9	322	21	372	37
223	0	273	13	323	23	373	33
224	0	274	16	324	23	374	33
225	0	275	17	325	23	375	30
226	0	276	19	326	25	376	30
227	0	277	18	327	24	377	28
228	0	278	17	328	24	378	28
229	0	279	18	329	23	379	26
230	0	280	20	330	24	380	25
231	0	281	20	331	24	381	26
232	1	282	19	332	24	382	25
233	4	283	18	333	26	383	25
234	7	284	17	334	26	384	26
235	8	285	17	335	28	385	24
236	10	286	14	336	27	386	24
237	6	287	12	337	27	387	25
238	6	288	11	338	27	388	26
239	6	289	11	339	27	389	27
240	8	290	10	340	26	390	28
241	5	291	9	341	26	391	29
242	4	292	10	342	26	392	29
243	7	293	11	343	26	393	30
244	7	294	12	344	27	394	30
245	7	295	14	345	26	395	30
246	8	296	14	346	27	396	30
247	11	297	12	347	27	397	28
248	10	298	12	348	28	398	28
249	8	299	13	349	28	399	29
250	9	300	15	350	32	400	27

TABLE C-3. DRIVING CYCLE WITH STARTING RANDOM NUMBER 1567897373 (CONTINUED)

ALL ST. LOUIS TRUCKS, NONFREEWAY

PAGE 3 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
401	28	441	44	481	42	521	29
402	29	442	43	482	41	522	29
403	29	443	42	483	40	523	29
404	29	444	42	484	40	524	30
405	29	445	42	485	40	525	30
406	30	446	42	486	40	526	30
407	30	447	43	487	40	527	30
408	31	448	43	488	40	528	30
409	31	449	44	489	40	529	30
410	30	450	43	490	40	530	31
411	30	451	43	491	39	531	31
412	27	452	44	492	39	532	32
413	28	453	44	493	40	533	33
414	28	454	43	494	40	534	33
415	29	455	42	495	41	535	30
416	30	456	42	496	41	536	28
417	30	457	42	497	41	537	27
418	30	458	42	498	42	538	27
419	30	459	42	499	43	539	26
420	32	460	42	500	43	540	26
421	33	461	42	501	43	541	24
422	34	462	42	502	43	542	23
423	34	463	42	503	42	543	20
424	35	464	42	504	42	544	19
425	36	465	43	505	42	545	18
426	36	466	43	506	41	546	17
427	36	467	44	507	37	547	16
428	36	468	44	508	37	548	15
429	35	469	44	509	36	549	14
430	36	470	44	510	36	550	13
431	36	471	44	511	35	551	11
432	37	472	44	512	32	552	8
433	37	473	44	513	32	553	4
434	38	474	44	514	31	554	3
435	38	475	44	515	30	555	2
436	41	476	44	516	30	556	0
437	42	477	44	517	29	557	0
438	43	478	42	518	30	558	0
439	46	479	42	519	29	559	0
440	48	480	42	520	29	560	0

FIGURE C-3. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 1567897373

DATA BASE: ALL ST. LOUIS
TRUCKS, NONFREEWAY

AVERAGE SPEED = 16.03 MPH
DURATION = 9.33 MIN
DISTANCE = 2.49 MILES

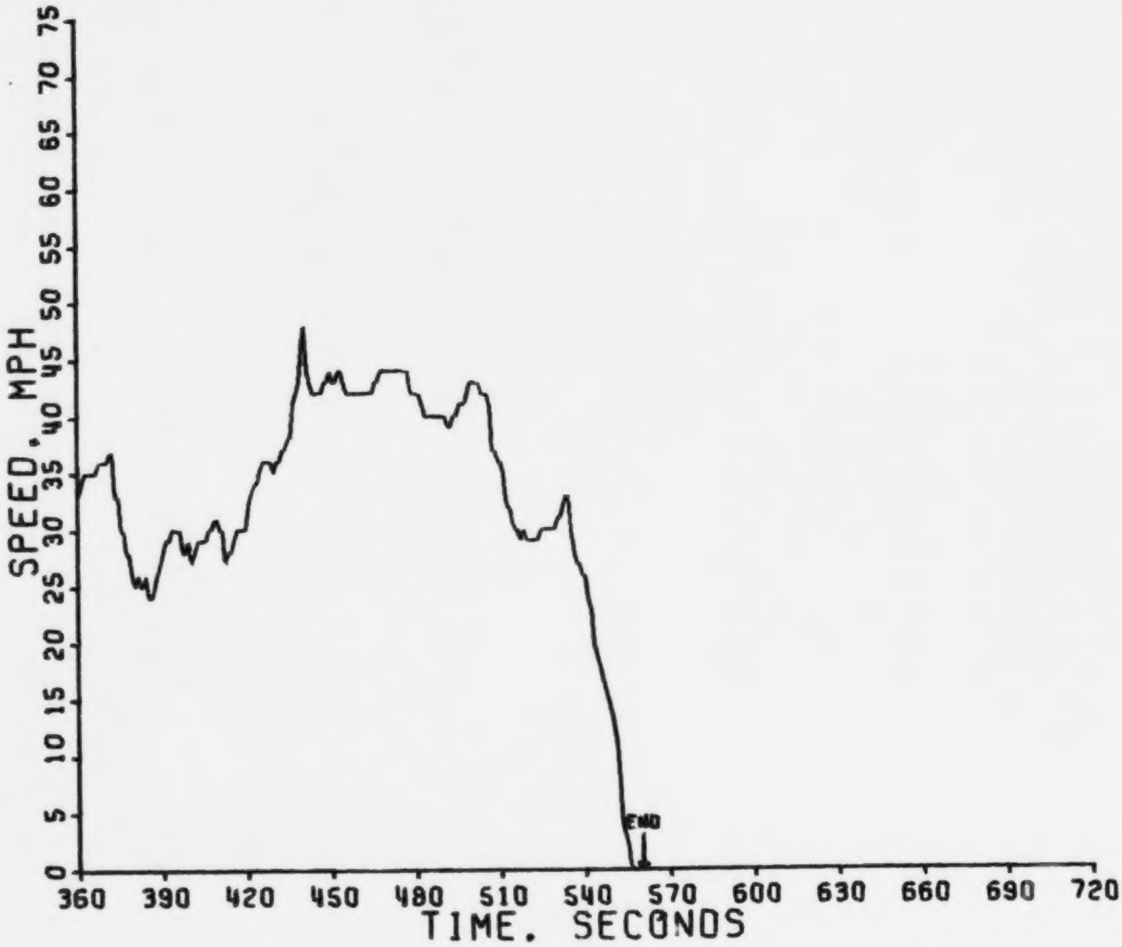

FIGURE C-4.

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 2115319983

DATA BASE: ST. LOUIS TRANSIT
BUSES, NONFREEWAY

AVERAGE SPEED = 10.80 MPH
DURATION = 9.08 MIN
DISTANCE = 1.64 MILES

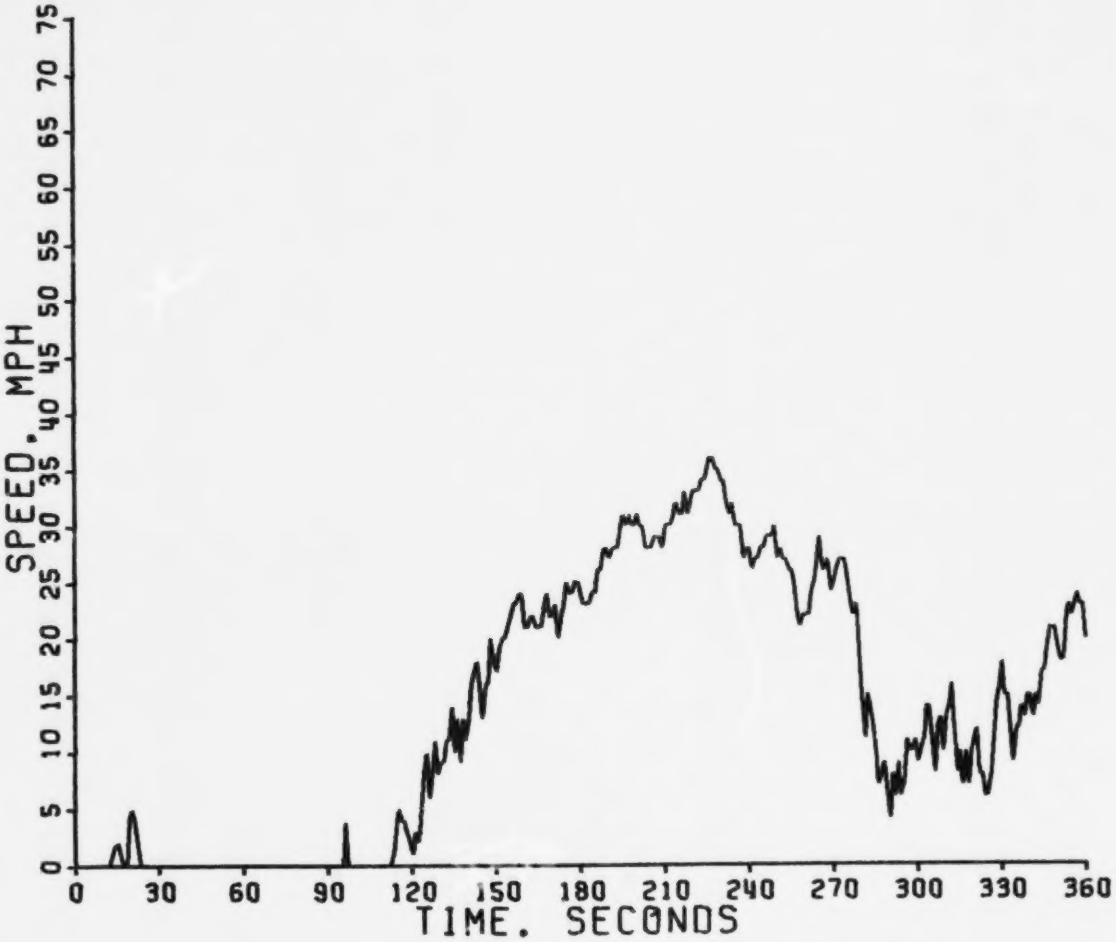

TABLE C-4. DRIVING CYCLE WITH STARTING RANDOM
NUMBER 2115319983

ST. LOUIS TRANSIT BUSES, NONFREEWAY

PAGE 1 OF 3

SECOND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
0	0						
1	0	51	0	101	0	151	19
2	0	52	0	102	0	152	20
3	0	53	0	103	0	153	20
4	0	54	0	104	0	154	21
5	0	55	0	105	0	155	22
6	0	56	0	106	0	156	23
7	0	57	0	107	0	157	23
8	0	58	0	108	0	158	24
9	0	59	0	109	0	159	24
10	0	60	0	110	0	160	21
11	0	61	0	111	0	161	21
12	0	62	0	112	0	162	22
13	1	63	0	113	1	163	22
14	2	64	0	114	3	164	21
15	2	65	0	115	5	165	21
16	1	66	0	116	4	166	21
17	0	67	0	117	4	167	23
18	0	68	0	118	3	168	24
19	4	69	0	119	2	169	22
20	5	70	0	120	1	170	22
21	4	71	0	121	3	171	23
22	2	72	0	122	2	172	20
23	0	73	0	123	5	173	22
24	0	74	0	124	8	174	23
25	0	75	0	125	10	175	25
26	0	76	0	126	6	176	24
27	0	77	0	127	8	177	24
28	0	78	0	128	11	178	25
29	0	79	0	129	8	179	25
30	0	80	0	130	9	180	24
31	0	81	0	131	9	181	23
32	0	82	0	132	11	182	23
33	0	83	0	133	11	183	23
34	0	84	0	134	14	184	24
35	0	85	0	135	10	185	24
36	0	86	0	136	13	186	26
37	0	87	0	137	9	187	26
38	0	88	0	138	13	188	28
39	0	89	0	139	11	189	28
40	0	90	0	140	13	190	27
41	0	91	0	141	16	191	28
42	0	92	0	142	17	192	28
43	0	93	0	143	18	193	28
44	0	94	0	144	16	194	30
45	0	95	0	145	13	195	31
46	0	96	4	146	16	196	30
47	0	97	0	147	16	197	31
48	0	98	0	148	20	198	30
49	0	99	0	149	18	199	30
50	0	100	0	150	17	200	31

FIGURE C-4. (CONTINUED)

DRIVING CYCLE WITH STARTING
RANDOM NUMBER 2115319983

DATA BASE: ST. LOUIS TRANSIT
BUSES, NONFREEWAY

AVERAGE SPEED = 10.80 MPH
DURATION = 9.08 MIN
DISTANCE = 1.64 MILES

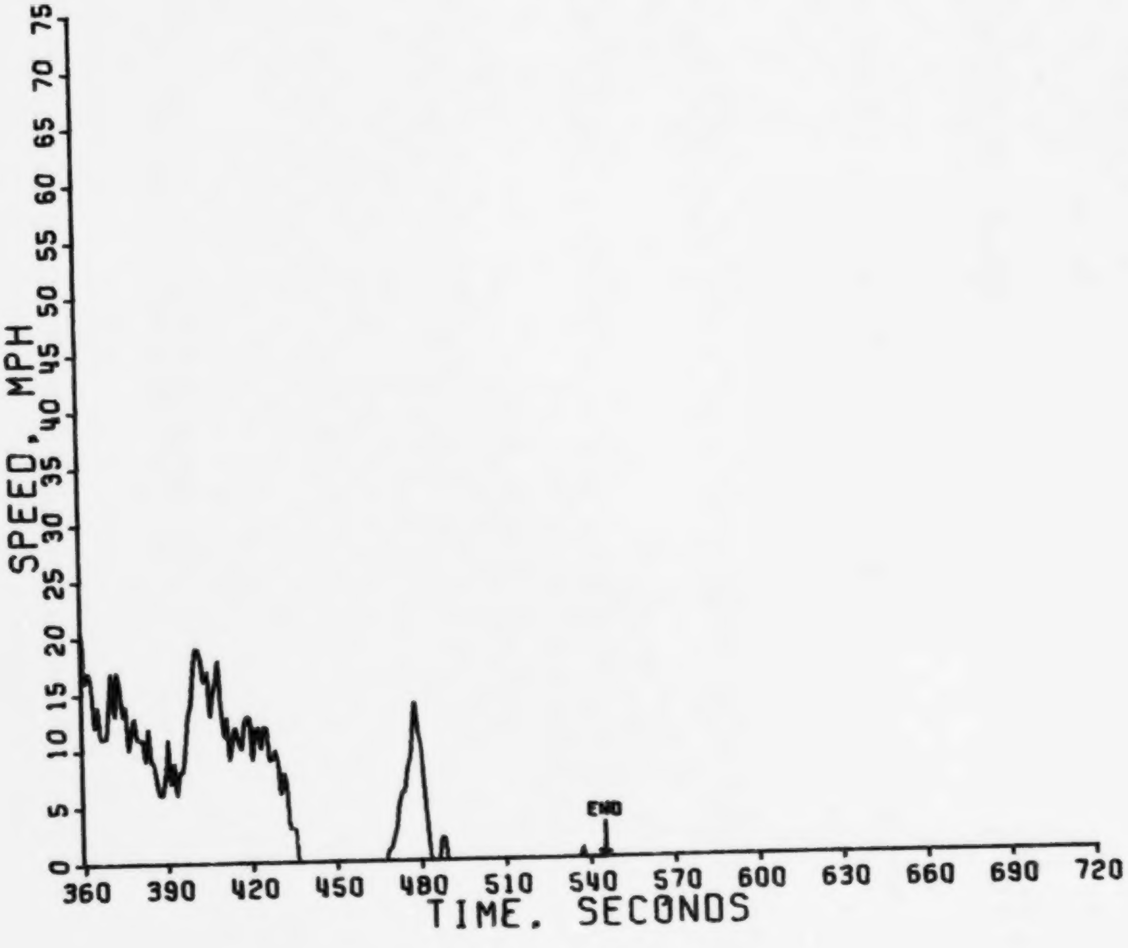

TABLE C-4. DRIVING CYCLE WITH STARTING RANDOM NUMBER 2115319983 (CONTINUED)

ST. LOUIS TRANSIT BUSES, NONFREEWAY

PAGE 2 OF 3

SECCND	MPH	SECOND	MPH	SECOND	MPH	SECOND	MPH
201	30	251	28	301	10	351	18
202	30	252	27	302	11	352	18
203	28	253	27	303	14	353	22
204	28	254	26	304	14	354	23
205	28	255	26	305	11	355	22
206	29	256	25	306	8	356	23
207	29	257	22	307	12	357	24
208	29	258	21	308	13	358	23
209	28	259	22	309	10	359	23
210	30	260	22	310	13	360	20
211	30	261	22	311	14	361	16
212	30	262	24	312	16	362	17
213	31	263	25	313	12	363	16
214	32	264	27	314	8	364	12
215	31	265	29	315	10	365	14
216	31	266	26	316	7	366	11
217	33	267	26	317	10	367	11
218	31	268	27	318	7	368	11
219	32	269	24	319	10	369	14
220	33	270	25	320	11	370	17
221	33	271	26	321	12	371	13
222	33	272	27	322	8	372	17
223	34	273	27	323	8	373	16
224	34	274	27	324	6	374	13
225	35	275	25	325	6	375	14
226	36	276	23	326	8	376	10
227	36	277	22	327	11	377	12
228	35	278	23	328	14	378	13
229	35	279	19	329	16	379	11
230	34	280	15	330	18	380	11
231	34	281	11	331	15	381	11
232	32	282	15	332	15	382	9
233	31	283	14	333	12	383	12
234	32	284	12	334	9	384	9
235	30	285	10	335	12	385	9
236	30	286	7	336	12	386	7
237	30	287	8	337	14	387	6
238	27	288	9	338	13	388	6
239	28	289	7	339	15	389	8
240	28	290	4	340	15	390	11
241	26	291	8	341	13	391	7
242	27	292	6	342	15	392	9
243	27	293	9	343	14	393	6
244	28	294	6	344	17	394	8
245	28	295	7	345	17	395	8
246	29	296	11	346	19	396	10
247	29	297	10	347	21	397	13
248	29	298	10	348	21	398	14
249	30	299	11	349	21	399	17
250	27	300	9	350	19	400	19

TABLE C-4. DRIVING CYCLE WITH STARTING RANDOM NUMBER 2115319983 (CONTINUED)

ST. LOUIS TRANSIT BUSES, NONFREEWAY

PAGE 3 OF 3

SECCND	MPH	SECOND	MPH	SECCND	MPH	SECOND	MPH
401	19	438	0	475	8	512	0
402	18	439	0	476	9	513	0
403	16	440	0	477	12	514	0
404	17	441	0	478	14	515	0
405	13	442	0	479	11	516	0
406	15	443	0	480	10	517	0
407	16	444	0	481	7	518	0
408	18	445	0	482	3	519	0
409	14	446	0	483	0	520	0
410	11	447	0	484	0	521	0
411	13	448	0	485	0	522	0
412	9	449	0	486	0	523	0
413	11	450	0	487	2	524	0
414	12	451	0	488	2	525	0
415	11	452	0	489	0	526	0
416	10	453	0	490	0	527	0
417	12	454	0	491	0	528	0
418	13	455	0	492	0	529	0
419	13	456	0	493	0	530	0
420	9	457	0	494	0	531	0
421	12	458	0	495	0	532	0
422	12	459	0	496	0	533	0
423	10	460	0	497	0	534	0
424	12	461	0	498	0	535	0
425	12	462	0	499	0	536	0
426	9	463	0	500	0	537	1
427	9	464	0	501	0	538	0
428	10	465	0	502	0	539	0
429	9	466	0	503	0	540	0
430	6	467	0	504	0	541	0
431	8	468	1	505	0	542	0
432	7	469	1	506	0	543	0
433	3	470	2	507	0	544	0
434	3	471	3	508	0	545	0
435	3	472	5	509	0		
436	0	473	6	510	0		
437	0	474	6	511	0		